YUKON RIVER SALMON 2006 SEASON SUMMARY AND 2007 SEASON OUTLOOK

Prepared by

THE UNITED STATES AND CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

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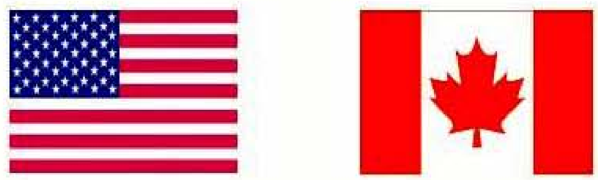
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518, USA



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, Special Publications and the Division of Commercial Fisheries Regional Reports. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	\$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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The Regional Information Report Series was established in 1987 and was redefined in 2006 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.sf.adfg.ak.us/statewide/divreprots/htlm/intersearch.cfm.

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1.0 ABSTRACT

The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews and preseason outlooks, and results of cooperative research projects. The report summarizes the status of salmon stocks (Chinook, coho, summer and fall chum salmon) in 2006 with reference to historical data, presents an outlook for the 2007 season, and provides data on the utilization of salmon species by commercial and subsistence (aboriginal) harvests, personal use (domestic) and sport (recreational) fishery. The report further compiles summaries of Yukon River projects (e.g., mark–recapture, sonar, stock identification) and a review of salmon bycatch in the groundfish and pollock fisheries of the Bering Sea and the Gulf of Alaska. Yukon River escapement goals for Chinook, chum and coho salmon remained unchanged for 2007.

Keywords: Yukon watershed, Yukon River Salmon Agreement, Chinook salmon, chum salmon, coho salmon, escapement, season outlook

2.0 INTRODUCTION

The United States and Canada Joint Technical Committee (JTC) was established in 1985 and serves as a scientific advisory body to the Yukon River Panel. The JTC meets semi-annually to discuss harvest and escapement goals, management trends, preseason outlooks and postseason reviews, and results of cooperative research projects. The fall JTC meeting was held November 27–29, 2006 at the Hotel Captain Cook, Anchorage Alaska. The JTC reviewed all Canadian and U.S. proposals to the Research and Enhancement (R&E) fund (specific comments were received) and discussed enhancement of conceptual proposals. The JTC R&E sub-committee held a meeting to discuss a variety of issues associated with the proposal process. Geneticists from ADF&G (Lisa Seeb, Bill Templin), USFWS (John Wenburg, Blair Flannery) and DFO (John Candy) led a discussion on the current state of genetic baselines for Yukon Drainage Chinook and chum salmon and began discussions to identify gaps and how to fill them. Tissue and data sharing agreements were also discussed and strategies for obtaining multiple tissue samples for all labs were documented. Sandy Johnston gave a brief update of the Canadian wild salmon policy and comments were heard regarding the level of genetic resolution required for different questions on the Yukon River. Lisa Seeb gave a presentation on informative SNP loci for differentiating Western Alaska chum salmon. Postseason summaries were provided for Chinook and summer chum (Steve Hayes, ADF&G), fall chum and coho salmon (Bonnie Borba, ADF&G) and Canadian fisheries (Pat Milligan, DFO). Mary Ellen Jarvis provided an overview and update of Canadian aboriginal fisheries. Carl Pfisterer (ADF&G) provided a summary of activities and results from Pilot Station and Eagle sonar projects. Dani Evenson (ADF&G) provided a report from the JTC salmon size sub-committee. Bonnie Borba and Eryn Kahler (ADF&G) updated the committee on *Ichthyophonus* studies, Rick Ferguson (DFO) summarized the coded wire tag (CWT) program at the Whitehorse Hatchery and Dick Wilmot (NMFS) provided an overview of marine fisheries issues including an update of current bycatches of Chinook and chum salmon in the BSAI/GOA Pollock fishery.

The spring JTC meeting was held March 27–29 at the Canadian Department of Fisheries and Oceans boardroom, in Whitehorse, YT. Preseason run outlooks for 2007 were summarized for U.S. Chinook and summer chum (Steve Hayes), U.S. fall chum and coho (Bonnie Borba) and Canadian chum and Chinook (Pat Milligan). A discussion of escapement targets for Chinook and chum salmon on the mainstem Yukon and Fishing branch followed. Dick Wilmot provided an overview of marine fisheries issues, including the most current figures for Chinook salmon bycatch in the BSAI/GOA Pollock fishery. Hamachan Hamazaki (ADF&G) detailed his analysis of contribution rate estimates for CWT marked White Horse Hatchery Chinook to commercial and subsistence fisheries in view of current sampling levels. The JTC discussed the effectiveness and utility of continued expenditures to mark these fish. Pat Milligan reported on meetings of the Salmon Size sub-committee, including next steps for generating testable hypotheses and potential proposals that might be submitted to funding sources. Tom McLain (USFWS) summarized discussions within the *Ichthyophonus* sub-committee to suggest an appropriate course of action for further investigations and monitoring of the disease. Sandy Johnston presented results of discussions within the genetics sub-committee to develop a comprehensive list of baseline samples currently held among the three genetics labs, create a prioritized list of gaps in baseline population samples from the U.S. and Canada, develop a plan for the acquisition of those samples, continue efforts to exchange needed tissues between laboratories and standardize field collection methods. The body had a general discussion about operation of the U.S. border sonar project and the Canadian mark–recapture project to estimate mainstem border passage of Chinook salmon. Two specific issues were how long to simultaneously run the projects and when to adopt a new escapement target based upon the sonar project. Al von Finster (DFO) reported on deliberations by the R&E sub-committee, including an overview of decisions on proposals and an update on improvements to the proposal process. Hugh Monaghan (Yukon River Panel) attended this discussion for specific administrative input. The meeting concluded with a discussion about issues surrounding attendance of non-JTC members at technical committee meetings and assignment of reporting responsibilities at the next Yukon River Panel meeting.

Meeting participants and affiliations:

Meeting Attended:

* Fall only
# Spring only

Executive Secretary, Yukon River Panel
- Hugh J. Monaghan#

Fisheries and Oceans Canada (DFO)
- Sandy Johnston (JTC Co-Chair)
- John Candy*
- Rick Ferguson
- Mary Ellen Jarvis
- Patrick Milligan
- Al von Finster

Alaska Department of Fish and Game (ADF&G)
- Eric Volk (JTC Co-Chair)
- Dan Bergstrom
- Bonnie Borba
- Audra Brase*
- Caroline Brown
- Fred Bue#
- Lara Dehn
- Christian Smith*
- Bill Templin*
- Larry DuBois*
- Dani Evenson
- Hamachan Hamazaki
- Steve Hayes
- Eryn Kahler*
- Carl Pfisterer*
- Lisa Seeb*
- Tom Taube*

US Fish and Wildlife Service (USFWS)
Jeff Adams
Jeff Bromaghin
Russ Holder*
Tom McLain

National Marine Fisheries Service (NOAA-NMFS)
Dick Wilmot

Bureau of Land Management (BLM)
Bob Karlen

US Geological Survey-Biological Research Division (USGS-BRD)
Jim Finn*
Chris Zimmerman

Tanana Chiefs Conference (TCC)
Brandy Berkbigler
Mike Smith*

Association of Village Council Presidents (AVCP)
Jennifer Hooper*
David Waltemyer

Bering Sea Fishermen's Association (BSFA)
Chris Stark

Yukon River Drainage Fisheries Association (YRDFA)
Kristin Mull

Fisheries Information Service-Office of Subsistence Management (FIS-OSM)
Cliff Schleusner*

3.0 COMMERCIAL FISHERY–ALASKA

3.1 CHINOOK AND SUMMER CHUM SALMON

The Yukon River drainage is divided into fishery districts and sub-districts for management purposes (Figure 1). ADF&G uses an adaptive management strategy that evaluates run strength inseason to determine a harvestable surplus above escapement requirements and subsistence uses. Preseason, a management strategy was developed in cooperation with federal subsistence managers that outlined run and harvest outlooks along with the regulatory subsistence salmon fishing schedule described in an information sheet. The 2006 strategy was to implement the subsistence salmon fishing schedule as salmon began to arrive in each district or sub-district in a stepwise manner. Before implementing this schedule, subsistence fishing would be allowed 7 days a week to provide opportunity to harvest non-salmon species, such as whitefish, sheefish, pike, and suckers. Additionally, the informational sheet was used to prepare fishers for possible reductions to the subsistence salmon fishing schedule or to allow for a small commercial fishery contingent on how the runs developed. The information sheet was mailed to Yukon River commercial permit holders and approximately 2,800 families identified from ADF&G's survey and permit databases. State and federal staff presented the management strategy to the Yukon River Drainage Fisheries Association (YRDFA), State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected parties.

3.1.1 Chinook Salmon

In 2002–2005, preseason management strategies were developed to not allow commercial fishing until near the midpoint of the Chinook salmon run. This interim strategy was designed to pass fish upstream for escapement, cross-border commitments to Canada, and subsistence uses in the event of a very poor run as occurred in 2000. However, a drawback of this approach is commercial fishing is concentrated on stocks migrating during the latter half of the run, thus the harvest is not spread out over the entire run. Further, if the run is strong, delaying commercial fishing results in foregone commercial harvest opportunities. The preferred strategy for managing commercial fisheries is to fish during the middle 50% of the run, starting near the first quarter point of the run. This strategy was in place before the decline in 1998. Additional harvest after this point can occur late in the season based on information from escapement projects. In 2006, based on the preseason projections and inseason run assessments, a commercial fishing period was scheduled on the historic first quarter point (June 15) for Chinook salmon, and the commercial harvest was spread over the middle 50% of the run. Additional harvest after the third quarter point is dependent on information from assessment projects and the availability of commercial markets.

Emmonak test fishing indices, subsistence harvest reports, and Pilot Station sonar passage estimates provide information the department uses to assess the inseason salmon run. As the run progresses upriver, other projects provide additional run assessment information.

Yukon River Chinook salmon return primarily as age-5 and age-6 fish, although age-4 and age-7 fish also contribute to the run. Assuming an approximately normal return of 5-year-old and 6-year-old fish, the 2006 run was expected to be average to below average and similar to the 2005 run. Given the uncertainties associated with 1999 and 2000 declines in escapement, it was anticipated the run would provide for escapements, support a normal subsistence harvest, and a below average commercial harvest; and therefore, the department developed a conservative preseason management strategy in 2006 with a potential harvest ranging from 30,000–60,000 Chinook salmon.

The lower Yukon River was ice-free on May 29, 7 days later than the historic average of May 22 (1979–2004). The first subsistence catch of Chinook salmon was reported from Mountain Village on June 4. ADF&G's test fishing project recorded its first Chinook salmon catch on June 6. The conditions in the lower river during the early portion of the season were characterized by high water. As snowmelt in the middle and upper portions of the Yukon River decreased, the water level dropped to normal levels.

According to test fishing CPUE data, approximately 50% (the midpoint) of the Chinook salmon run had entered the lower river by June 24, 5 days later than the average date for the midpoint (Figure 2). The Pilot Station sonar preliminary passage estimate was approximately 169,403 Chinook salmon (Appendix Table A2). The cumulative set gillnet test fishery CPUE in 2006 was 21.81 (Figure 2). Compared to previous years, this CPUE was above the 2001–2005 average of 20.54, but below the 1989–1997 (before the run decline) and 2003–2004 average of 25.74.

As the run developed, it became clear the 2006 Chinook salmon run was developing as expected and was similar to the run observed in 2005.

The border passage estimate from the Eagle sonar project was approximately 74,000 Chinook salmon. However, the escapement target into Canada based on the Canadian fishwheel mark/recapture border passage estimate, currently at a rebuilding level of 28,000 Chinook salmon, was not met in 2006 (27,990 escapement estimate). However, relatively good escapements were observed in most Canadian tributaries, at the Whitehorse fishway, and the 74,000 fish were estimated at Eagle Sonar. This discrepancy could be due to problems associated with the Canadian fishwheel border passage estimate for 2006. However, the escapement target had been achieved consistently during the 5 years prior to 2006.

In summary, the 2006 Chinook salmon run was slightly stronger than the run of 2005, but still below the 1989–1998 and 2003 average run size.

3.1.2 Summer Chum Salmon

The Yukon River summer chum salmon run was managed according to the guidelines described in the Yukon River Summer Chum Salmon Management Plan (Appendix Table A3). The management plan provides for escapement needs and subsistence use priority before other consumptive uses such as commercial, sport, and personal use fishing. The plan allows for varying levels of harvest opportunity depending on the run size projection. The department uses the best available data to assess the run: 1) preseason run outlooks, 2) Pilot Station sonar passage estimate, 3) test fishing indices, 4) age and sex composition, 5) subsistence and commercial harvest reports, and 6) escapement monitoring projects.

The summer chum salmon entry was characterized as being 2 days early in run timing. The 2006 summer chum salmon run passage at Pilot Station was the highest on record (approximately 3.8 million fish), exceeding the previous record observed in 1995 (Appendix Table A2). By June 20, the summer chum salmon run at Pilot Station had exceeded 1 million fish, a level that would have allowed a directed summer chum salmon fishery. Most summer chum harvest was incidental to fishing directed at Chinook salmon, due to the lack of a summer chum market. However, one short fishing period was directed at chum salmon in District 2 and six fishing periods were directed at chum salmon in District 6. The total commercial harvest was 92,116 summer chum salmon; there were no sales of salmon roe.

3.1.3 Harvest and Value

A total of 45,829 Chinook and 92,116 summer chum salmon were commercially harvested (Appendix Table A1) and sold in the round in the Alaska portion of the Yukon River drainage in 2006. The historical commercial harvest includes the number of salmon sold in the round and the estimated number of salmon harvested to produce roe sold. The Chinook salmon harvest was the sixth lowest commercial harvest since statehood and 14% below the 1996–2005 average harvest of 53,183 fish. The summer chum salmon harvest was the tenth lowest since 1967 and 22% below the 1996–2005 average harvest of 118,583 fish (and is attributed to market conditions rather than harvestable surplus).

A total of 594 permit holders participated in the Chinook and summer chum salmon fishery, which was 6% below the 1996–2005 average of 631 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) in Alaska are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 569 permit holders fished in the Lower Yukon Area in 2006, which was 4% below the 1996–2005 average of 592 permit holders. In the Upper Yukon Area in Alaska, 25 permit holders fished, which was 44% below the 1996-2005 average of 45 permit holders.

Yukon River fishermen in Alaska received an estimated $3.4 million for their Chinook and summer chum salmon harvest in 2006, approximately 4% above the 1996–2005 average of $3.3 million.

3.1.4 Results by District

Districts 1–3

A short commercial opening was scheduled on the pre-selected average historical quarter-point of June 15 to assist in salmon marketing efforts. Run assessment indications and late run timing indicated that the short commercial opening would harvest a limited amount of fish. A small, early commercial harvest would not impact the run based on the preseason run outlook. District 2 was opened to commercial opening for 3 hours on June 15, which was the shortest commercial opening targeting Chinook salmon on record. Although this commercial period was controversial, it worked out well with a small harvest of approximately 900 Chinook salmon, of which 63% were males.

The department then delayed opening the next commercial period until June 19 in District 1. On June 17, the department estimated the first quarter of the run for the lower river test fishing project to be around June 19, and based on this run timing, projected the Pilot Station sonar passage for Chinook salmon would be near 170,000 for the year and the cumulative lower river test fishery CPUE would reach 22–24.

Commercial fishing was again delayed until the start of the second Chinook salmon pulse identified by the lower river test fishery project on June 23–26 with a total CPUE of 7.62 and Pilot Station sonar on June 25–27 with a passage estimate of approximately 44,400 Chinook salmon.

In 2006, ten unrestricted mesh size commercial fishing periods were scheduled in Districts 1 and 2 combined and one restricted mesh size (6-inch or less) commercial fishing period in District 2.

However, market conditions for summer chum salmon in the lower river remained weak and no additional restricted commercial periods were scheduled. Additionally, two commercial fishing periods occurred in District 3 with unrestricted mesh size, which were the first scheduled commercial openings in this district since 1999.

The combined total harvest of 43,906 Chinook salmon for Districts 1, 2, and 3 was 20% below the 1996–2005 (excluding 2001) average harvest of 55,230 fish. The average weight of Chinook salmon in Districts 1, 2, and 3 commercial harvests was 19.0 pounds. Estimated age composition of Chinook salmon samples collected from the lower river commercial harvest was 1.8% age-4, 49.7% age-5, 47.0% age-6, and 1.4% age-7 fish. The lower than average weight was in part caused by the higher than average proportion of 5-year-old fish in the harvest. Sex composition of the samples was 48.3% females and 51.7% males.

Combined commercial summer chum salmon harvest in District 1, 2, and 3 of 47,475 fish and was 16% above the 1996–2005 (excluding 2001) average harvest of 40,744 fish. Average weight of summer chum salmon in Districts 1, 2, and 3 commercial harvests was 6.8 pounds.

Districts 4–6

Historically, the Subdistrict 4-A fishery targets summer chum salmon. The dominant gear type, fish wheels, and the location of the fishery, result in a very high chum-to-Chinook salmon ratio. No commercial deliveries were reported in 2006 in Subdistrict 4-A because of weak market conditions for summer chum salmon.

The Anvik River met the minimum escapement of 500,000 summer chum salmon required to allow an inriver commercial fishery, however, the Anvik River Management Area remained closed to commercial fishing in 2006 because of a lack of markets for summer chum salmon.

Although the commercial fishing season in District 4 was opened with commercial periods scheduled 5 days per week to foster interest by catcher/sellers, and one buyer was registered, no commercial deliveries were recorded due to the lack of commercial interest in the area.

Five commercial fishing periods were allowed in Subdistricts 5-B and 5-C for a total of 60 hours of fishing time. A total of 15 fishers harvested 1,839 Chinook salmon (Appendix Table A1). This number was 15% below the lower end of the guideline harvest range of 2,150 fish. Typically, the harvest of summer chum salmon is low in these subdistricts as they are located far above the vast majority of summer chum spawning areas, and only 20 summer chum salmon were harvested commercially in 2006. No commercial fishing periods were announced for Subdistrict 5-D due to a lack of buyers.

Commercial fishing in District 6 consisted of six periods for a total of 390 hours in 2006. Summer chum salmon were targeted during these commercial fishing periods with some Chinook salmon incidental harvested. Test fish wheel and commercial catches indicated that the summer chum salmon run in the Tanana River was above average. The total estimated commercial harvest was 84 Chinook and 44,621 summer chum salmon harvested by 10 fishers. The Chinook salmon harvest was well below the guideline harvest range of 600–800 fish.

The age and sex of Chinook salmon from the upper river commercial harvests in Alaska (District 5) was 10.2% age-4, 67.9% age-5, 21.1% age-6, and 0.8% age-7 fish. Sex composition was 38.6% females and 61.4% males. Fish wheels, the dominant gear type in the Upper Yukon River Area, are generally biased in their harvests, tending to catch a higher number of smaller Chinook salmon, which are mostly males.

3.2 FALL CHUM AND COHO SALMON

Assessment of fall chum and coho salmon runs begin from the time the fish enter the mouth of the Yukon River and continue until they reach their spawning grounds in Alaska and Canada. Fall chum salmon typically take 34 days to migrate as far as the U.S./Canada border. For management purposes, the Yukon River is divided into fishery districts, subdistricts, and drainages (Figure 1). In managing the fall chum salmon fishery, the department follows guidelines provided by the Board of Fisheries (BOF) in 5 AAC 01.249. (Title 5 of the Alaska Administrative Code, Chapter 01.249.) Yukon River Drainage Fall Chum Salmon Management Plan. Coho salmon within the Yukon River have a slightly later, but overlapping, run timing with fall chum salmon and the department follows guidelines adopted by the BOF in 5 AAC 05.369. Yukon River Coho Salmon Management Plan.

The preseason outlook for the 2006 fall commercial fishery did anticipate commercial harvest opportunity based on the record large return of 4-year-old fall chum salmon in 2005. Although both parent year escapements were less than 400,000 fall chum salmon, the 2001 brood year resulted in tremendous production providing a record run in 2005 and also provided the majority of the 2006 run which was above average. In 2006, limited markets, along with inseason run assessment resulted in fishing time that was well above normal levels. Nevertheless, a large surplus remained unharvested because of the uncertainty in market location, assessment, and lower market demand and fishing effort.

3.2.1 Fall Chum Salmon Management Overview

Good returns of fall chum salmon continued in the 2006 season as a consequence of exceptionally high production from the 2001 brood year. As a result, subsistence fishing was again off the windowed schedule from the beginning of the season and was further relaxed as the season progressed. Commercial fishing periods were scheduled to maximize available markets through close cooperation of salmon buyers with fishery managers. The commercial harvest was managed in accordance with established guideline harvest ranges. However, fishing effort and prices remain low and most escapement goals were exceeded.

The Yukon River Drainage Fall Chum Salmon Management Plan (Appendix Table A4) incorporates the U.S./Canada treaty obligations for border passage of fall chum salmon and provides guidelines, which are necessary for escapement and prioritized uses. There are incremental provisions in the plan to allow varying levels of subsistence salmon fishing balanced with requirements to attain escapement objectives. Commercial fishing is generally only allowed on the portion of the surplus above the upper end of the drainage wide Biological Escapement Goal (BEG) range of 300,000 to 600,000. The intent of the plan aligns management objectives with the established BEG’s, provides flexibility in managing subsistence harvest when the stocks are low, and bolsters salmon escapement as run abundance increases.

Most fall chum salmon typically enter the Yukon River from mid-July through early September in unpredictable pulses that usually last 2 to 3 days. Generally, four or five such pulses occur each season. These pulses are often associated with onshore wind events and/or high tides. Consequently, assessing the run strength is difficult when pulse size and run timing vary so drastically.

The 2006 preseason run projection ranged from 1.0 to 1.4 million fall chum salmon. A point estimate of 1.2 million was derived by utilizing the 1974 to 1983 odd/even maturity schedules to represent the recent trend of higher production. The projection range was based on the upper and lower values of the 80% confidence bounds for the point projection. The 2006 run size was anticipated to provide for escapement requirements and for subsistence and personal use fisheries with a surplus of 100,000 to 400,000 fall chum salmon available for commercial harvest.

With an expectation of continued strong production, the 2006 preseason management strategy was to begin the fall season on the pre-2001 subsistence fishing regulations in accordance with the management plan. Commercial fishing was anticipated to begin near the first quarter point in run timing for the lower river dependent upon early run assessment. This would allow time for late summer chum to move out of the area thereby improving market quality and it allowed some of the earlier upriver fall chum salmon stocks to pass through the area unharvested. Initial inseason assessment of fall chum salmon for 2006 was influenced by the exceptional performance of the summer chum salmon run that had an estimated run size of 3.8 million, which was well above the average of 1.8 million. The historical relationship between the summer and fall chum salmon (1993–1995, 1997–2005) suggested the fall run would perform similarly and thereby increased manager's confidence in the fall chum salmon preseason projection.

The fall chum salmon run was assessed inseason by the drift gillnet test fishery index projects located at Emmonak (operated by ADF&G), Mountain Village (operated by Asacarsarmiut Traditional Council) and in the middle Yukon River at Kaltag (operated by the City of Kaltag). The Pilot Station sonar project, located in the lower river, provided daily passage estimates of fall chum salmon used to derive run size projections which triggered management actions as dictated by the fall chum salmon management plan. Relationships in run timing and run strength from the various index projects and subsistence fishing reports were compared for consistency with the Pilot Station sonar estimates as a method to check if projects appeared to be operating correctly. In 2006, each pulse of fall chum salmon appeared to correlate well between assessment projects for run timing and relative magnitude of each pulse except for some discrepancy of a fourth pulse at the end of August, which may have been missed by Pilot Station sonar. Individual pulses were tracked as they moved up river and the Pilot Station sonar was used to estimate the abundance of each pulse (Figure 3).

The fall chum salmon run was strong from the beginning of the season. The first significant pulse began entering the mouth of the Yukon River on July 16 and lasted one day. The abundance was estimated to be approximately 85,000 fish by the Pilot Station sonar and was suspected to contain a large proportion of summer chum. The pulse was followed by 8 days of low passage rates before the second pulse began entering on July 27. The size of the second pulse was approximately 284,000 fish and lasted 6 days. A third pulse began entering the river on August 12, lasted 2 days, and was estimated by the Pilot Station sonar to include approximately 128,000 fall chum salmon. The Pilot Station sonar cumulative total estimate of fall chum for the 2006 season was 791,000 fish through August 31 (Appendix Table A2). The Mountain Village test fish project indicated the passage of a fourth pulse on August 29 which was not reflected by increased passage at Pilot Station sonar during the last days of the project. The end of season run reconstruction of 1.1 million fall chum salmon suggests that the total run size may have been as much as 200,000 fish larger than accounted for in Pilot Station sonar estimate when considering harvest removal. However, confidence intervals for the various estimation methods overlap and it is assumed that approximately 5% of the run passes after the sonar is shut down for the season.

The early inseason run assessment indicated that the fall chum salmon run was on track for an above average total run size near the preseason projection. The fall chum salmon management plan went into effect on July 16 by regulation and subsistence fishing management actions, initiated during the summer season, were continued into the fall season. The Coastal District, Districts 1–4 and the Innoko River were open 7 days per week. Similar management, consistent with the pre-2001 subsistence salmon fishing regulations, continued sequentially in the Alaskan Upper Yukon Area districts as the fall chum salmon run migrated into those areas.

The first pulse of fall chum salmon passed through the Lower Yukon Area with little exploitation which was expected to benefit escapement and upriver fishers. Commercial salmon markets were known to be weak. District 1 and Subdistrict 6-B had buyer commitments prior to the season with additional buyers expressing interest in purchasing salmon in District 2 and Subdistrict 5-C. The first commercial period was opened in the lower river District 1 on July 30 when buyers were confident few summer chum salmon would be mixed in the directed fall chum salmon fishery. The Pilot Station sonar cumulative count through July 30 of 299,000 was significantly above the historical average of 156,000 for that date and was projecting a total season run size of 1 million fish.

Commercial market interest increased as the season progressed and District 2 had their first open period on August 2. Fisheries managers worked closely with commercial fish buyers to maximize processing capacity and available transportation opportunities. Frequent short periods were planned based on daily market capacity. Buyers and fishers also worked together to improve the quality of their harvest by more careful handling, improved icing techniques, and quicker deliveries. Furthermore, in an effort to maximize fishing efficiency, fishing times in District 1 were scheduled to coincide with daily high tides, which typically carry new fish into the river where they become available for harvest. However, late season night-time darkness becomes a factor so daylight fishing times were scheduled to maintain fishermen safety.

Beginning on August 1, in Districts 1, 2, and 3, subsistence fishing was open 7-days a week, 24-hours a day except for closures around each commercial salmon fishing period. The length of closed subsistence fishing time was reduced in the lower river districts to compensate for lost subsistence opportunity because of frequent commercial periods. With the increased frequency of commercial fishing periods, the amount of subsistence fishing closure time around commercial periods was reduced from 12 hours to 6 hours before, during, and 6 hours after each commercial fishing period.

The commercial salmon fishing season in the lower Yukon River normally closes on or before September 1 by regulation. The first half of the season was strong with the projected run size to exceed market capacity. However, the rate fall chum salmon were entering the river had slowed beginning in mid-August. Furthermore, the majority of the Tanana River stocks tend to enter the Yukon River later in the season. Since the second half of the fall chum salmon was not as strong as the first half, early indications were that there might be some weakness in the Tanana River stocks. In addition, a project in development by the US Fish and Wildlife Service, that uses genetic samples taken at the Pilot Station sonar site to apportion the stock composition by spawning ground origin inseason, supported the assessment that Tanana River fall chum salmon abundance might not be as strong as other stocks. Even though there was continued market interest for both fall chum and coho salmon, the fall season was extended by only two additional commercial periods through September 5 in District 1 to assure there would be adequate commercial fishing opportunity in upriver areas based on guideline harvest ranges (GHR) specified in regulations.

The increased strength of recent fall chum salmon runs has renewed interests for commercial fishing in upriver districts. In an effort to rebuild market interest in Subdistrict 4-A, commercial fishing periods were opened 5 days a week beginning in the summer season and continued through the fall season, but no commercial landings were made. Subsistence fishing was open 7-days/week and was concurrent with commercial periods in Subdistrict 4-A. There was also a market to land commercial fish in District 5 at the Haul Road Bridge on the Yukon River. A harvest of up to 30,000 fall chum salmon was allocated for Subdistricts 5-B and 5-C combined. However, only 10,030 fish were landed by five fishermen and a high-water event coincided with the peak of the fall chum salmon passage through that area which made fishing effort unproductive. Subsistence fishing time in Subdistricts 5-A, 5-B, and 5-C was increased to 7-days a week after commercial fishing activity ceased.

Commercial salmon fishing in District 6 began September 1 on a schedule of two 42-hour periods a week. The Tanana River is managed under the Tanana River Salmon Management Plan, which provides guidelines to manage District 6 as a terminal fishery based on the assessed strength of the stocks in the Tanana drainage. The Tanana River commercial harvest of 23,353 fall chum salmon was allowed to exceed the upper end of the GHR of 2,750 to 20,500. It was anticipated that after the closure of the commercial season in District 6, subsistence fishing activities would continue which would spread harvest throughout the run. Subsistence fishing was further increased to 7-days a week after September 30 in accordance with the Tanana River management plan. Even with an increased subsistence harvest, which was attributed to the availability of subsistence fishers using efficient commercial fishing gear already in place and the commercial fishery exceeding the upper end of the GHR, the postseason assessment indicated that escapement goals were exceeded in the Tanana River.

The 2006 total run of fall chum salmon was approximately 1.1 million fish which was within the projected range. The commercial harvest of 175,000 fall chum salmon was the second highest since 1995 and preliminary indications are the subsistence harvest of approximately 80,000 was the second highest since 1999. The preliminary Yukon River drainage wide escapement of 870,000 fall chum is the second largest since 1995. The above average escapement in 2006 followed the 2005 escapement of 1.8 million, which was the largest in the past 30 years.

Overall, the above average run of 1.1 million fall chum salmon and moderate harvest level, caused by limited market capacity and low subsistence effort, resulted in an exploitation rate of 24%. This rate is above the previous 10-year average from 1996–2005 of 17% and below the 10-year average from 1986–1995 of 38%. The amount of commercial opportunity was exceptionally high and subsistence opportunity was very liberal. All escapement goals throughout the drainage, including those for Canadian-origin stocks, were attained or exceeded.

3.2.2 Coho Salmon Management Overview

The 2006 coho salmon run was managed to provide for escapement needs, subsistence use, and allow some commercial harvest. However, the commercial harvest of coho salmon was largely dependent upon the abundance of fall chum salmon and accompanying management strategies used to harvest fall chum salmon. The 2006 coho salmon outlook was for a continuation in the trend of above average runs, below average subsistence harvests because of low effort, and an expected commercial harvest of 50,000 to 70,000 fish.

The coho salmon run passage began early and slowed to a near-average total run size based on the run timing at Pilot Station sonar. Test fish projects at Emmonak, Mountain Village, Kaltag, and in the Tanana River provided similar run assessments of magnitude and run timing. The run size estimate at Pilot Station sonar through August 31 was approximately 132,000 fish, which was below the historical average (1995–2005) passage estimate of 147,000 coho salmon (Appendix Table A2).

The preseason market outlook favored fall chum salmon, but readily accepted coho salmon and paid a similar price per pound. Even though the primary focus of commercial fishing was on fall chum salmon, fishing periods were also controlled to spread harvest impacts throughout the run of the smaller coho salmon stock. As with fall chum salmon, transportation costs were a major limiting factor in the coho salmon fishery. Fish buyers only operated near the transportation hubs in the lower river Districts 1 and 2 and upriver Subdistrict 6-B near Nenana. Fishers had to weigh the price of gas in relation to the benefits of potential commercial harvests. The extended commercial season and liberalized subsistence fishing time increased fishing opportunity for coho salmon throughout the drainage.

3.2.3 Harvest and Value

The 2006 Alaskan commercial harvest of 174,542 fall chum salmon was the second largest landing since 1995 and the commercial harvest of 64,942 coho salmon was the largest landing since 1991 (Appendix Table A1). The Yukon Area commercial fall chum salmon harvest was approximately 3.6 times greater than the 1996–2005 average of 37,908 fall chum salmon and the coho salmon harvest was approximately 2.3 times greater than the 10-year average of 19,669 coho salmon (Appendix Tables B4 and B5). However, weak market conditions and limited buying capacity limited the commercial harvest in portions of the drainage.

There were 28 commercial fishing periods in the lower river Districts 1 and 2 combined (17 periods in Y-1; 11 periods in Y-2) with no periods opened in District 3 due to lack of a market. Subdistrict 4-A had weekly 5-day long periods from July 4 until October 1 with no reported commercial harvest. Subdistricts 5-B and 5-C began the fall season with two 48-hour periods followed by one 216-hour period. In the Tanana River, District 6, there were five 42-hour commercial salmon fishing periods beginning September 1 until September 17 when the catch exceeded the upper end of the guideline harvest range.

The preliminary 2006 commercial season value of fall chum and coho salmon for the Yukon Area was $297,879 ($252,936 for the Lower Yukon Area, $44,943 for the Upper Yukon Area). The previous 10-year average value for the Yukon Area was $93,093 ($77,968 for the Lower Yukon Area, $15,070 for the Upper Yukon Area).

Yukon River fishers received an average price of $0.20 per pound for fall chum salmon in the Lower Yukon Area and $0.14 per pound in the Upper Yukon Area in 2006. This compares to the 1996–2005 average of $0.22 per pound and $0.13 per pound, respectively, for years when commercial sales occurred. For coho salmon, fishers received an average price of $0.20 per pound and $0.19 per pound in the Lower and Upper Yukon Areas compared to the recent 10-year average price of $0.29 and $0.10 per pound, respectively.

In 2006, 306 permit holders fished the fall chum and coho salmon fishery (289 for the Lower Yukon Area, 17 for the Upper Yukon Area). The number of participants was well above the recent 10-year average (1996–2005) of 117 (110 for the Lower Yukon Area, 7 for the Upper Yukon Area), which was plagued by low markets and poor returns. In comparison, the 1980s had much larger numbers of participating permit holders ranging from 619 to 833.

The preseason outlook for the 2006 fall commercial fishery did anticipate commercial harvest opportunity based on the record large return of 4-year-old fall chum salmon in 2005. Although both the 4-year and 5-year old parent year escapements were less than 400,000 fall chum salmon, the 2001 brood year resulted in tremendous production providing a record return in 2005 and also provided the majority of the 2006 run which was above average. In 2006, limited markets, along with inseason run assessment resulted in fishing time that was well above normal levels. Nevertheless, a large surplus remained unharvested primarily due to market conditions, lack of tendering, and lower fishing effort than in the 1980s.

4.0 COMMERCIAL FISHERY–CANADA

4.1 CHINOOK SALMON

A preliminary total of 2,332 Chinook, 4,096 fall chum and one coho salmon was harvested in the Canadian Yukon River commercial fishery in 2006 (Appendix Table A5). The combined species catch of 6,429 salmon was 39% below the 1996–2005 average commercial harvest of 10,508 salmon. Since 1997, there has been a marked decrease in commercial catches of Upper Yukon River Chinook and fall chum salmon. This has been the result of a limited market as well as reduced fishing opportunities in some years due to below average run sizes. Canadian Upper Yukon commercial, non-commercial and Porcupine River Chinook salmon harvests for the 1961 to 2006 period are presented in Appendix Table B7, while similar information for fall chum salmon is presented in Appendix Table B8.

Twenty of the 21 eligible commercial fishing licenses were issued in 2006, the same as in 2005. Twenty-one commercial licenses were issued in both 2003 and 2004.

The 2006 preseason outlook for Canadian-origin Yukon River Chinook salmon was a below average to average run of approximately 93,000 fish. Uncertainty regarding recent outlooks is apparent by the poor total run sizes of Upper Yukon Chinook salmon in the 1998 to 2001 period, which were significantly lower than expected despite healthy brood year escapements.

The key elements of the 2006 Canadian Integrated Fisheries Management Plan (IFMP) for Yukon Chinook salmon as developed by the Yukon Salmon Committee (YSC) were as follows:

> i) A target spawning escapement goal of 28,000 Chinook salmon. This goal was consistent with the Yukon River Panel recommendation from the March 2006 Yukon Panel meeting. The YSC recommended allowing First Nation fisheries to occur as long as the spawning escapement was greater than 18,000 Chinook salmon and the First Nation catch was consistent with the Yukon River Salmon Agreement harvest sharing provisions.
>
> ii) Commercial, recreational and domestic fisheries would be given opportunities to fish if inseason run projections indicated that requirements for conservation, i.e., the target spawning escapement goal of 28,000, and First Nations harvests would likely be achieved.

Similar to previous years since 2001, the 2006 Integrated Fisheries Management Plan (IFMP) established a series of color coded categories (Red, Yellow and Green Zones), bound by specific reference points (run sizes into Canada), and were associated with anticipated management actions. For example, the Red Zone included run projections of less than 19,000 Chinook salmon. The anticipated management action for projections falling in the Red Zone would result in all fisheries being closed with the exception of the test fishery. A test fishery would not be allowed if the run projection was less than 11,000. In the Yellow Zone, described as a run size projection in the 19,000 to 37,000 range, only the First Nations fishery and an assessment test fishery would operate. Restrictions in the First Nation fishery would depend upon the run abundance and be increasingly more severe the closer the run projection was to 19,000, the lower end of the Yellow Zone. The Green Zone included run size projections greater than 37,000 Chinook salmon. The anticipated management actions for run projections in the Green Zone include unrestricted First Nations fisheries and consideration for harvest opportunities in the commercial, domestic and recreational fisheries depending on abundance and international harvest sharing provisions.

Given a total run outlook of 93,000 Upper Yukon Chinook salmon (at the river mouth) and upon considering proposed management actions in Alaska, it was expected the border escapement would be at least 43,000 Chinook salmon and Canadian fisheries would be managed in the Green Zone. The 2006 season commenced with closures in place for both the commercial and domestic fisheries. The recreational fishery remained open during the early part of the summer season. If there was a need for restrictive recreational management actions, they would have been implemented prior to significant numbers of salmon reaching the primary fishing areas.

Throughout most of June and the first few days of July, before Chinook salmon entered the Canadian section of the Upper Yukon River, Alaskan test fisheries and the Pilot Station sonar project, located near the river mouth, indicated to US managers that run abundance was adequate to provide for US border escapement obligations, US subsistence fishing, and a limited US commercial harvest. Chinook salmon were first caught in the Fisheries and Oceans Canada (DFO) fish wheels on July 4, 6 days later than the 1996–2005 average date of June 29. Since 1985, there have been 7 years when the first Chinook salmon has been caught in early July; four of seven of these late returns have occurred since 1999. A total of 1,231 Chinook salmon was caught in the fish wheels, 74% of the 1996–2005 average catch of 1,663 Chinook.

The primary purpose of DFO fish wheels is to live-capture salmon throughout the run for tagging purposes; fish are tagged and subsequently released. Recoveries of tagged fish, primarily in the Dawson area commercial fishery, are used to estimate the abundance of fish throughout the season. Inseason projections of the total run into Canada, also referred to as “border escapement”, are developed by expanding the point estimates of run size developed from the mark–recapture data by historical run timing information. The projections are a key component in Canadian management decisions.

In recent years, the opening of the commercial fishery has frequently been delayed in response to conservation concerns and/or uncertainties about the status of the run. When tag recoveries are unavailable due to the absence of a commercial fishery, there is a need to implement a test fishery to provide stock assessment data for inseason run assessment as there is little else upon which to rely for inseason run projections. The option of using just the DFO fish wheel catch has not been chosen because of a poor historical relationship between the fish wheel catch and run size estimates. In 2006, information from the US test fishery at Emmonak, the Pilot Station sonar program, and the initiation of a U.S. commercial fishery on the lower Yukon River suggested that the Canadian Chinook salmon escapement target would likely be achieved and a Total Allowable Catch (TAC) would be established. It was deemed unlikely that FN fisheries would be restricted and fishing opportunities would likely be available for the Canadian commercial, domestic[1] and recreational fisheries. Because of the favorable inseason run abundance indicators in Alaska, and considering the cost and effort required to mobilize a test fishery, it was not necessary to conduct a test fishery. Instead, a limited commercial fishery early in the 2006 season was initiated to determine the status of the Chinook salmon run. If managers assessed the run to be of sufficient strength to meet the spawning escapement goal and FN requirements, subsequent openings in the commercial fishery and other fisheries would be scheduled.

The first opening in the Chinook salmon commercial fishery occurred during a 4-day period from July 14th to July 18th with an average of seven fishers participating. Three additional openings subsequently took place: a 3-day fishery opening, which started at noon July 21, a 2-day fishery opening, which started at noon July 28, and finally, a 3-day fishery opening, which started at noon August 4. The peak weekly catch of 720 Chinook salmon occurred during the July 21–24 opening. Weekly catch and effort for all openings are summarized in Appendix Table A5.

Inseason border escapement run projections were usually produced two times a week throughout the 2006 season. Early in the season, the run size projections were very sensitive to the run timing information used because early timing information represented a very small proportion of the total run. The border escapement run projections are expanded based on what is considered to be the likely timing scenario (i.e., early, average or late timing) given the information at hand (U.S. fishery and assessment data, and early indications in Canada). The intent of applying different expansions is to ensure that the projections cover an appropriate range of potential differences in run timing. An example of one of the early 2006 inseason projections was a border escapement estimate of 6,200 (95% CI range of 4,200–9,200) on July 23. This estimate projected a total season abundance of 38,700 to the border based on historical DFO fish wheel timing data and a 6-day late timing scenario. Inseason run projections through August 10 ranged from approximately 42,000 to 50,000.

The total catch of Chinook salmon in the commercial fishery was 2,332 fish of which 2,229 were taken in the "Dawson area" fishery, downstream of the confluence of the Yukon and White Rivers, and 103 Chinook salmon were caught in the "upper fishing area" (Appendix Table A5).

The Chinook salmon commercial fishery was open for a total of 12 days and total fishing effort was 93 boat-days (Appendix Table A5). For comparison, the previous 10-year average (1996-2005) commercial catch was 3,512 Chinook salmon; this average does not include year 2000, when the fishery was closed, however it includes very low catches in 1998 and 2002 when the commercial fishery was severely restricted. Generally, commercial catch levels in 2006 were hampered by limited markets.

4.2 Fall Chum and Coho Salmon

The preseason expectation for 2006 Upper Yukon River fall chum salmon was an average run. Spawning escapements in 2001 and 2002, the primary brood years contributing to the 2006 run, were 33,500 and 98,700 fall chum salmon, respectively. Although spawning escapement was excellent for the 1994 to 1996 period (averaging 126,300 and ranging from 98,400 to 158,100), the cycle year returns from these escapements were well below average and appeared to have been significantly impacted by poor marine survival. However, there was improvement in the

[1] The domestic fishery is opened on the same schedule as the commercial fishery.

run sizes observed in 2003 and 2004 and an exceptional run occurred in 2005; based on age data, over 90% of the 2005 return was comprised of 4-year old fish from the 2001 brood year.

The Canadian fall chum salmon management plan for 2006 acknowledged the recent improvements in run size from 2003 through 2005 and the likelihood of an average run in 2006. The plan contained the following key elements:

> i) A minimum spawning escapement target of >80,000 Upper Yukon River fall chum salmon, which was consistent with the Yukon Panel recommendation of March 2006;
>
> ii) A limited commercial fall chum salmon fishery was expected, which would likely be initiated early in the 2006 season for inseason run projections if managers thought that the spawning escapement goal and First Nation's requirements would likely be achieved; and
>
> iii) A minimum spawning escapement target of 28,000 Fishing Branch River fall chum salmon, which was consistent with the Yukon Panel recommendation of March 2006.

In 2006, funding was available from the Yukon River Restoration and Enhancement fund for a live-release fall chum salmon test fishery in the Dawson City area to obtain tagging data for population estimates. A similar project was conducted jointly by the Yukon River Commercial Fishing Association and the Tr'ondek Hwech'in First Nation in 2002, 2003 and 2004. Prior to 2002, projections of fall chum salmon border escapement were developed from either the DFO fish wheel catch data, or from catch and tag recovery data collected from the Tr'ondek Hwech'in First Nation fishery and the commercial fishery located in the Dawson area.

Similar to the decision matrix developed for Chinook salmon, a fall chum salmon decision matrix was developed in the 2006 Integrated Fisheries Management Plan. Red, Yellow and Green management zones were described by specific reference points (run sizes into Canada) and expected management actions. The Red Zone included run projections of less than 40,000 fish when closures in all fisheries except for the live release test fishery could be expected. The Yellow Zone included run projections in the 40,000 to 83,000 range; within this zone, the commercial, domestic and recreational fisheries would be closed and the First Nation fishery would be reduced with restrictions increasingly more severe the closer the run projection was to the lower end of the Yellow Zone. The Green Zone included run size projections greater than 83,000 fall chum salmon and indicated that First Nation fisheries would be unrestricted and that harvest opportunities in the commercial, recreational and domestic fisheries would be considered depending on run abundance and international harvest sharing provisions. The difference between the escapement goal (>80,000) and the trigger point for the Green Zone was 3,000 fall chum salmon, which would fully satisfy the needs of the Canadian aboriginal fishery. Management discretion is used when the inseason projections are close to the trigger points.

The total fall chum salmon catch in the DFO fish wheels in 2006 (6,283) was approximately 29% higher than the 1996 to 2005 average of 4,881. Information from U.S. stock assessment projects, including the Pilot Station sonar program, the Rampart Rapids fish wheel program and inseason analyses of Pilot Station DNA samples, indicated that the Canadian Upper Yukon fall chum salmon run escapement target would likely be achieved and a Total Allowable Catch (TAC) would be established. Given the early indications of average to above average run abundance, a live-release test fishery was considered unnecessary in 2006. A 4-day commercial fishery was initiated on September 3rd, followed in successive weeks by another 4 day opening, two 5-day openings, and two 7-day openings. The domestic fishery was opened on the same schedule as the commercial fishery. Despite the liberal fishing opportunities, the number of fishers participating in the 2006 commercial fishery was low and no domestic fishers fished for fall chum salmon (Appendix Table A5).

The total commercial fall chum salmon catch of 4,096 fish was 50.2% of the 1996 to 2005 average of 8,161 fall chum salmon (Appendix Table B8; Appendix Figure B7). During this period, the catch has ranged from zero fall chum salmon in 1998 (when the fishery was closed due to conservation concerns) to 20,069 fall chum salmon in 1996. The fall chum salmon commercial fishery is somewhat of a misnomer since virtually all of the commercial catch is used for what could be termed personal needs; license holders use most of the catch to feed their personal sled dog teams. This situation could change with the development of local processing capability and a move towards the sale of value-added products such as smoked fall chum salmon and salmon caviar. One coho salmon was recorded in the commercial catch in 2006.

5.0 SUBSISTENCE, PERSONAL USE, ABORIGINAL, DOMESTIC, AND SPORT FISHERIES

5.1 ALASKA

5.1.1 Subsistence Salmon Fishery

Subsistence salmon fishing activities in the Yukon Area typically begin in late May and continue through early October. Salmon fishing in May and October is highly dependent upon river ice conditions. Fishing activities are usually based from a fish camp or a home community. Extended family groups, representing two or more households, often work together to harvest, cut, and preserve salmon for subsistence use. Some households from communities not located along the mainstem Yukon River operate fish camps along the mainstem Yukon River.

Throughout the drainage most Chinook salmon harvested for subsistence use are dried, smoked or frozen for later human consumption. Summer chum, fall chum and coho salmon harvested in the lower Yukon Area are primarily utilized for human consumption and are also dried, smoked, or frozen for later use. In the upper Yukon Area, small Chinook (jack), summer chum, fall chum, and coho salmon are all an important source of food for humans, but a larger portion of the harvest is fed to dogs which are used for recreation, transportation and drafting activities (Andersen 1992). Most subsistence salmon used for dog food are dried (summer chum salmon) or frozen in the open air “cribbed” (fall chum and coho salmon).

In 2006, all salmon runs were judged sufficient to provide for escapement and subsistence needs, as well as border passage commitments to Canada. Subsistence fishing for Chinook and summer chum salmon was open 7 days a week prior to commencement of the Board of Fisheries (BOF) regulatory window schedule beginning June 1 in the lower Yukon Area District 1. The window schedule was in place for approximately 3 weeks and implemented sequentially in upriver districts according to dates consistent with the Chinook salmon migratory timing. Once the Chinook and summer chum salmon runs were assessed to have a surplus above escapement needs and subsistence use, the subsistence salmon fishing schedule reverted back to the pre-2001 BOF subsistence fishing regulation, and the commercial fishing season was opened. Subsequently, the subsistence salmon fishing schedule was liberalized to provide additional fishing opportunities. The inseason management strategy for the fall season was to continue the liberalized subsistence summer fishing schedule into the fall season. This management decision was based on the strong performance of the summer chum salmon run that provided confidence in the 2006 preseason projection that the fall chum salmon run would be more than sufficient to meet escapement goals and subsistence uses, and provide for commercial fishing opportunities. Coho salmon abundance was also assessed large enough to meet escapement objectives and provide for additional subsistence and commercial salmon fishing opportunities. As the fall season developed, much of the drainage was open 7 days per week for subsistence salmon fishing. In districts and subdistricts where commercial salmon fishing took place, the amount of subsistence salmon fishing time was increased by allowing additional openings around the commercial fishing periods. Throughout the summer and fall fishing season, fishing opportunities for non-salmon fish species were also available during subsistence salmon closed periods. Stipulations for harvesting non-salmon species during closed salmon periods allowed the use of gillnets with 4 inch or less stretch mesh and a maximum length of 60 feet, but prohibited the operation of fish wheels.

Inseason fishers’ reports suggested that, in general, most Yukon Area subsistence households met their subsistence needs for salmon in 2006. Subsistence households in the Lower Yukon Area reported good catches of Chinook and summer chum salmon, and commonly reported meeting their needs. However, many middle Yukon and Koyukuk River households reported having trouble meeting their needs for Chinook salmon because of difficulties in catching them due to high water and debris conditions. The fishers that did meet their subsistence household needs for Chinook salmon reported they had to work harder than normal to harvest the fish. In addition to the poor fishing conditions from high water, many fishers indicated fishing efforts were further hampered because the fishing schedule and Chinook salmon run timing in their area did not coincide. Another commonly cited reason was that the fishing schedule conflicted with work opportunities, and when the fishing schedule was subsequently liberalized, most of the “good” Chinook salmon had already traveled by their area. On the other hand, fishers reported more success in harvesting summer chum salmon because of the extremely large run, despite the high water conditions. Other reported factors that influenced success in meeting subsistence salmon needs included the high price of gasoline, fuel shortages, health, lack of fishing gear, and mechanical problems. Fishers in many communities avoided repetitive travel to fish camps because of high fuel cost. In most cases, they fished near their home community or waited until the peak of the run occurred in their area before attempting to fish. Similarly, as in the past couple years, many individuals took advantage of work opportunities on fire-fighting crews within and outside of Alaska, and consequently did not fish.

Postseason subsistence surveys are conducted annually to provide an estimate of salmon harvested by subsistence fishing households in the Alaskan portion of the Yukon River drainage. Typically, surveys are conducted in 33 communities beginning in early September and continuing through to early November. Surveyed households are selected randomly based on recent historical harvest patterns. Survey data are expanded to estimate total subsistence harvest in surveyed communities. In addition to postseason surveys, subsistence "catch calendars" are mailed to approximately 1,500 households in the non-permit portions of the Yukon River drainage. The calendars augment the survey information and provide harvest reports for households that are unavailable to be surveyed. In portions of the upper Yukon and Tanana River drainages that are road accessible, fishers are required to obtain subsistence or personal use fishing permits. Data collected from the subsistence permits are added to the total estimate of the subsistence salmon harvest provided by the survey portion. Subsistence harvest totals also include fish harvested from test fisheries and distributed to residents of communities near the projects. Data compilation is ongoing, and results of the 2006 survey and permit summary will be available in late spring of 2007.

Based on the survey program, an estimated 1,271 households fished for salmon from 31 communities in 2005 (not including the Coastal District communities of Hooper Bay and Scammon Bay) (Busher et al. *In prep*). Additionally, 173 subsistence and 27 personal use household permit holders fished for salmon in 2005. The estimated 2005 subsistence and personal use salmon harvest in the Alaska portion of the Yukon River drainage totaled 52,699 Chinook (Appendix Table B2), 79,054 summer chum (Appendix Table B3), 91,597 fall chum (Appendix Table B4), and 27,078 coho salmon (Appendix Table B5). Included in the estimated subsistence harvest are 138 Chinook, 152 summer chum, 133 fall chum, and 107 coho salmon taken in the personal use salmon fishery. Also included in the estimated subsistence harvest are approximately 2,308 Chinook, 3,379 summer chum, 3,441 fall chum, and 580 coho salmon distributed for subsistence use from the various test fish projects. Additionally, the estimated subsistence totals included 3,247 fall chum and 7,220 coho salmon harvested during the District 6 commercial salmon fishery. These fish were not marketable, and the fish were retained or given away by the commercial fishers. This information is based on the District 6 commercial fishery reporting requirement that stipulates that all fish caught and not sold by commercial fishers must be reported on harvest fish tickets. Predominately, these unmarketable fish were utilized for dog food.

5.1.2 Personal Use Fishery

The Fairbanks Non-subsistence Area, located in the middle portion of the Tanana River, contains the only personal use fishery within the Yukon River drainage. Subsistence or personal use permits have been required in this portion of the drainage since 1973. Personal use fishing regulations were in effect from 1988 until July 1990 and from 1992 until April 1994. In 1995, the Joint Board of Fisheries and Game reestablished the Fairbanks Nonsubsistence Area, and it has been managed consistently under personal use regulations since then. Historical harvest data must account for these changes in status. Subsistence fishing is not allowed within non-subsistence areas.

The management area known as Subdistrict 6-C is completely within the Fairbanks Nonsubsistence Area, and therefore falls under personal use fishing regulations. Personal use salmon and whitefish/sucker permits and a valid resident sport fishing license are required to fish within the Fairbanks Nonsubsistence Area. The individual personal use household permit harvest limit is 10 Chinook, 75 summer chum, and 75 fall chum and coho salmon combined. The personal use salmon fishery in Subdistrict 6-C has a harvest limit of 750 Chinook salmon, 5,000 summer chum salmon, and 5,200 fall chum and coho salmon combined.

In 2006, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week. Sixty personal use salmon and 7 personal use whitefish and sucker household permits were issued in 2006. Data compilation for the 2006 fishing season will not be completed until late spring of 2007. The results for the 2005 season included 138 Chinook, 152 summer chum, 133 fall chum, and 107 coho salmon harvested in Subdistrict 6-C. This harvest total was based on 27 households that fished out of 63 households that were issued personal use salmon household permits. The personal use harvest is included with the subsistence harvest in Appendix Tables B2, B3, B4 and B5. Additionally, 10 personal use whitefish and sucker household permits were issued in the Fairbanks Nonsubsistence Area in 2005. Personal use permit holders reported harvesting 84 whitefish, 3 sheefish, 7 burbot, 2 pike, 3 grayling, and 403 suckers.

5.1.3 Sport Fishery

Sport fishing effort for anadromous salmon in the Yukon River drainage is directed primarily at Chinook and coho salmon, with little effort directed at chum salmon. In this report, all of the chum salmon harvested in the sport fishery are categorized as summer chum salmon. Although a portion of the genetically distinct fall chum salmon stock may be taken by sport fishers, most of the sport chum salmon harvest is thought to be made up of summer chum salmon, because: 1) the run is much more abundant in tributaries where the most sport fishing occurs, and 2) the chum salmon harvest is typically incidental to efforts directed at Chinook salmon, which overlap in run timing with summer chum salmon.

Most of the drainage's sport fishing effort occurs in the Tanana River drainage along the road system. From 2001–05 the Tanana River on average made up 87% of the total Yukon River drainage Chinook salmon harvest, 23% of the summer chum salmon harvest, and 65% of the coho salmon harvest. Most Chinook and chum salmon are harvested from the Chena, Salcha, and Chatanika rivers, while most coho salmon are harvested from the Delta Clearwater and Nenana river systems.

Alaskan sport fishing effort and harvests are monitored annually through a statewide sport fishery postal survey. Harvest estimates are typically not available until approximately 1 calendar year after the fishing season; therefore, the 2006 harvest estimates will be available in the 2007 JTC report. The total sport harvest of salmon in the Alaskan portion of the Yukon River drainage in 2005 was estimated at 483 Chinook, 435 summer chum, and 627 coho salmon (Appendix Tables B2, B3, and B5). The recent 5 year (2001–2005) average Yukon River drainage sport salmon harvest was estimated at 1,176 Chinook, 548 summer chum and 1,213 coho salmon (Appendix Tables B2, B3, and B5). The 2005 harvests of Chinook salmon were lower than average due to high and turbid water conditions, which occurred during the peak of the run in the Chena and Salcha rivers.

In 2006 an emergency order was issued which liberalized the daily bag and possession limit of Chinook salmon in the Salcha River from 1 Chinook salmon > 20 inches per day to two Chinook salmon > 20 inches per day (effective July 27). This action was warranted because the Salcha River Chinook salmon escapement was well above the upper end of the BEG range.

5.2 CANADA

5.2.1 Aboriginal Fishery

In 2006, as part of the implementation of the Yukon Final Agreements (comprehensive land claim agreements), the collection of inseason harvest information for the Upper Yukon River was conducted by First Nations within their respective Traditional Territories. Before the start of the fishing season, locally hired surveyors distributed catch calendars to known fishers and asked them to voluntarily record catch and effort information on a daily basis. Interviews were then conducted inseason to obtain more detailed catch, effort, gear, location and tag recovery information at fish camps or in the communities, one to three times weekly. In most cases, weekly summaries were completed by the surveyors and sent to the DFO office in Whitehorse by fax or e-mail. Late or incomplete information was obtained postseason and reviewed by First Nation staff in conjunction with DFO.

With a below average to average preseason outlook for Upper Yukon Chinook salmon and an average outlook for Upper Yukon fall chum salmon, it was anticipated that aboriginal fisheries would not likely be restricted by conservation concerns. Recent run size trends and harvest levels suggested that 2006 Chinook and fall chum salmon escapement goals and aboriginal catch requirements would be achieved. However, a strategy was developed whereby aboriginal fisheries could be restricted, if required, to address conservation concerns. For both Chinook and fall chum salmon, early run assessment information indicated that there were no apparent conservation concerns and First Nations were notified that a normal harvest level would be permitted.

Fishers and First Nation staff commented that although the Chinook salmon run was late, it was a fair fishing season overall and the needs were mostly met in the communities. Some individuals commented that their harvests were lower than usual because they had scheduled holidays based on normal run timing and did not have the opportunity to fish when the run was at its peak.

The 2006 Upper Yukon Chinook salmon catch in the aboriginal fishery was 5,757, 16% below the recent 10-year average of 6,843 and 10% below the 2005 total of 6,376 (Appendix Table B7).

The total fishing effort for the 2006 Chinook salmon season is not available, because several communities did not report fishing effort. Comparative effort information is, however, available from communities where consistent survey methodology was applied. To the middle of August (statistical week 29), effort in the Dawson area Chinook salmon fishery was estimated by Tr'ondek Hwech'in First Nation to be approximately 5,268 net-hours, which is higher than the estimate of 4,420 net-hours reported in 2005. In the Mayo area, the estimate of effort provided by the Na-Cho Nyak Dun First Nation was 3,360 net-hours in 2006 compared to 3,048 net-hours in 2005. Data provided by the Selkirk First Nation shows an estimated effort of 4,978 net-hours in 2006 in the Pelly Crossing area compared to 4,678 net-hours in 2005.

The 2006 Upper Yukon fall chum salmon harvest in the aboriginal fishery was 2,521 (Appendix Table B8). This total is slightly higher than the previous 10-year average of 2,246 fall chum salmon and does not include harvest data from Carmacks area, which is currently unavailable. Participants in the 2006 fall chum salmon fishery described fishing as very good.

The estimate of total fishing effort reported in the Dawson area, where the majority of the fall chum harvest occurs, is 1,080 net-hours compared 408 net-hours recorded in 2005. There was also a small fall chum fishery on the mainstem Yukon River near Minto Landing where members of the Selkirk First Nation, based in Pelly Crossing, reported a total fishing effort of 437 net-hours in 2006 compared to 312 net-hours in 2005.

There was a continued conservation concern for the Porcupine fall chum salmon return prior to the 2006 season. The 2006 outlook for the total run size of Fishing Branch chum salmon predicted 42,800 fish. This outlook was based on an estimated return per spawner value of 2.5 and represented a poor return expected to fall below the escapement goal range of 50,000 to 120,000 fish to the Fishing Branch weir. Escapement counts in the two dominant brood years were 21,669 in 2001 and 13,563 in 2002. A pattern of observed run sizes being lower than preseason outlooks, which was evident for the 1998 to 2002 period, was attributed to poor marine survivals. However, the estimated runs in 2003 through 2005 were higher than the respective preseason outlooks; anecdotal information suggests there was improved marine survival in this period. Conservation measures implemented by the Vuntut Gwitchin Government (VGG) effectively reduced the aboriginal fishery catch at Old Crow within the 2002–2004 period, thus improving the escapement to the Fishing Branch River in these years. In 2002, the conservation initiative involved an effort to reduce the fall chum harvest to ~1,500 fish, approximately 25% of the recent harvest of 6,000; this effort was successful and the harvest was reduced to 1,860 chum salmon. In 2003 and 2004, the VGG endorsed a voluntary closure throughout the fall chum fishing season reducing the harvest to 382 and 205, respectively. These voluntary closures were an extremely effective way to improve spawning escapement. Lost harvest opportunities were offset by a fishery substitution program, which involved the purchase, transport and distribution of dog food[2] to community members for their sled dogs. This program was funded through a Yukon River Restoration and Enhancement Program.

In 2006, with assistance from the Yukon Restoration and Enhancement Fund, the VGG conducted a mark–recapture program on the Porcupine River near the community of Old Crow, Yukon. The main purpose of this project was to develop a tool to quantify the fall chum run size inseason and enable effective local management of the Old Crow aboriginal fishery. In addition, the VGG discussed options to guide harvesting activity at various run sizes as well as minimum escapement thresholds for the Fishing Branch River with the Yukon Salmon Committee and DFO. For example, if the mark–recapture program estimate indicated a low abundance of fall chum salmon, the allowable harvest could be lowered accordingly. This approach mirrors the abundance-based management system used on the mainstem Yukon River in Canada for both Chinook and fall chum salmon. Early in the season, estimates from the mark–recapture program combined with information from fisheries and assessment programs in the US portion of the Yukon River indicated that the Porcupine River fall chum salmon run was close to the preseason outlook. As a result, restrictions in the aboriginal fishery at Old Crow were not required.

Catch estimates for the Porcupine River near Old Crow are determined from locally conducted interviews using the catch calendar and voluntary recording system described above. During the fall chum salmon fishing season, data collection effort was intensive as timely catch and tag recovery information was useful in generating inriver mark–recapture estimates. Interviews were conducted with individual fishers up to four times weekly. Chinook and coho salmon harvest estimates were derived from the catch calendar information and postseason interviews.

A total of 5,179 fall chum salmon was harvested in the 2006 Old Crow aboriginal fishery; the 1996–2005 average harvest was 3,811[3] chum salmon. Fall chum salmon fishing was described as being excellent. An estimated 314 Chinook salmon were harvested; the 1996–2005 average was 256. The coho harvest was 111 compared to the 1996–2005 average of 222.

5.2.2 Domestic Fishery

The preliminary estimate of the total domestic fishery catch is 63 Chinook salmon (Appendix Table B7). The domestic fishery followed the same fishing schedule as the commercial fishery. This fishery was opened for twelve days during the summer season for Chinook salmon and 32

[2] Fall chum salmon harvested in the Old Crow aboriginal fishery are used primarily to feed recreational dog teams.
[3] This average includes below average catches within the 2002 to 2004 period when voluntary restrictions were used to conserve Fishing Branch River fall chum salmon.

days during the fall season for fall chum salmon. All fishing effort took place during the summer season. Seven domestic licenses were issued in 2006.

5.2.3 Recreational Fishery

In 1999, the Yukon Salmon Committee (YSC) introduced a mandatory Yukon Salmon Conservation Catch Card (YSCCC) in an attempt to improve harvest estimates and to serve as a statistical base to ascertain the importance of salmon to the Yukon recreational fishery. Anglers were required to report their catch via mail by late fall. The information requested includes the number, sex, size, date and location of salmon caught and released.

The preliminary estimate of the 2006 recreational harvest included 606 Chinook salmon, which were retained (Appendix Table B7); an additional 220 Chinook salmon were caught and released. The YSCCC program often involves some data interpretation and censoring, which in 2006 involved approximately 1% of retained catch data submitted. For example, in 2006 sockeye and coho salmon were both reported as a retained catch, however the catch of this species is highly unlikely based on the date and/or location reported.

The YSCCC includes a location code that outlines 16 Yukon locations, 4 Alsek River locations and a code for all other locations and a request that fishers “please specify” the other location. In 2006, 77.7% (471 fish) of the total retained recreational catch of 606 Chinook salmon was recorded from an area located within 1 km of either side of Tatchun Creek. Chinook salmon catches were also recorded from the Big Salmon River (2 fish), Klondike River (5 fish), Little Salmon River (1 fish), Mayo River (15 fish), Morley River (1 fish), Nisutlin River (3 fish), Quiet Lake (1 fish), Takhini River (1 fish), Teslin Lake (6 fish), Teslin River (64 fish), Yukon River downstream of Tatchun Creek (28 fish), Yukon River upstream of Tatchun Creek (7 fish) and another unspecified location (1 fish), which was assumed to be within the Yukon River drainage.

One hundred sixty-two (73.6%) of the 220 Chinook salmon caught and released were recorded in the area within 1 km of either side of Tatchun Creek. The number of Chinook salmon caught and subsequently released in other areas was as follows: Blind Creek (2 fish), Klondike River (2 fish), Nisutlin River (1 fish), Takhini River (9 fish), Teslin Lake (2 fish), Teslin River (25 fish), Yukon River downstream of Tatchun Creek (13 fish), Yukon River upstream of Tatchun Creek (1 fish) and other unspecified locations (3 fish), which were assumed to be within the Yukon River.

6.0 STATUS OF SPAWNING STOCKS IN 2006

Alaskan and Canadian researchers have developed projects to monitor escapement and to determine genetic composition, relative abundances, run characteristics, and other information pertinent to the annual salmon migration. Main river sonar, tributary sonar, weir, and counting tower projects and aerial surveys are used to monitor escapement. Other information collected at ground based projects may include, but is not limited to, salmon sex and length composition, scales for age determination, samples for genetic stock identification, data on resident species, and information from the recovery of tagged fish from various projects. Various government agencies, non-government organizations, and private contractors operate projects throughout the drainage (Appendix Tables A6 and A7).

6.1 CHINOOK SALMON

6.1.1 Alaska

The 2006 Yukon River Chinook salmon escapement in most tributaries was within or exceeded escapement goals. This assessment is based on escapement counts and estimates from selected tributaries. Sustainable escapement goals (SEG) for aerial survey assessments have been established for the East and West Fork Andreafsky, Anvik, Nulato and Gisasa rivers. All aerial survey escapement indices either were within or exceeded their SEGs, except for the East Fork Andreafsky River, which was incomplete. Biological escapement goals (BEG) have been established for the Chena and Salcha rivers located in the Tanana River drainage. In 2006, the Chena River Chinook salmon escapement estimate was 2,936 fish counted at the tower project and was within the established BEG (2,800–5,700) for this system. In the Salcha River, Chinook salmon escapement was estimated to be 10,400 fish (BEG 3,300–6,500) by the counting tower project. The large difference in escapement between the Chena and Salcha rivers was atypical. A summary of escapements can be found in Appendix Tables B9 and B10 and Appendix Figure B9.

Improved production has continued, as was evident by an above average percentage of the 5-year old age class in 2006. The relative proportion of 6-year old fish returns in the 2006 age, sex, and length (ASL) samples, although lower than historical averages, suggests good production from the low escapements for the 2000 brood year (Appendix Table A8). Age and sex composition data collected from escapement projects in 2006 are presented in Appendix Table A9.

6.1.2 Canada

The preliminary mark–recapture estimate of the total spawning escapement for the Canadian portion of the Upper Yukon River drainage is 27,990 Chinook salmon, which is close to the 2006 target escapement of 28,000 Chinook and is 7.9% below the 1996–2005 average of 30,405 Chinook salmon (Appendix Table B11). Similar to 2005, the escapement estimate derived from mark–recapture data appears biased low when compared to estimates derived from the border sonar program located near the community of Eagle, Alaska.

Aerial surveys of the Little Salmon, Big Salmon, Wolf, and Nisutlin river index areas were conducted by Fisheries and Oceans Canada (Appendix Table B11; Appendix Figure B10). Single (or multiple) aerial surveys do not count the entire escapement within an aerial index area as runs are usually protracted with the early spawning fish disappearing before the late ones arrive. Weather and water conditions, the density of spawning fish, as well as observer experience and bias also affect survey accuracy. Index surveys are rated according to survey conditions. Potential ratings include excellent, good, fair and poor. Surveys ratings other than poor are considered useful for inter-annual comparisons. Historical counts are documented in Appendix Table B11. Survey results for 2006, relative to the previous cycle averages, are summarized below.

The Little Salmon aerial survey was flown on August 18th. Survey conditions were rated as being excellent. The count of 1,381 Chinook salmon was the third highest recorded for this index area; the 1996–2005 average count was 896 Chinook.

The Big Salmon, Nisutlin, and Wolf river index areas were surveyed on August 16th under fair to good survey conditions. The Big Salmon count of 1,140 was 96.1% of the 10-year average of

1,186. The Nisutlin River index count of 601 was 47.3% higher than the 10-year average count of 408. The Wolf River count of 114 was 50.2% of the 10-year average count of 227 Chinook.

The Blind Creek weir was operational from July 16th to August 17th, 2006 when 677 Chinook salmon were counted (Appendix Table B11); the 1996 to 2005 average count is 776 Chinook. A total of 101 fish were sampled for age-sex-length data with 41 (40.6%) being female.

The Whitehorse Rapids Fishway Chinook salmon count of 1,720 fish, provided by the Yukon Fish and Game Association, was 12.6% higher than the 1996–2005 average of 1,527 fish (Appendix Table B11). The overall sex composition observed at the fishway was 47.6% female. Hatchery-produced fish (fish with adipose fins removed) accounted for 46.8% of the return and consisted of 503 males and 302 females. Wild fish (fish with adipose fins intact) accounted for 53.2% of the return and consisted of 398 males and 517 females. Historical fishway counts appear in Appendix Table B11.

6.2 SUMMER CHUM SALMON ALASKA

The 2006 summer chum salmon run was near record levels. The upper end of the drainage wide escapement objective for the Yukon River of 800,000–1,600,000 fish based on the Pilot Station sonar project was exceeded with an estimated 3,767,044 summer chum salmon passing the sonar site (Appendix Table A2), which is more than twice the 1997–2005 average of 1,130,044 fish.

The 2006 summer chum salmon escapement levels were above average in most tributaries (Appendix B14; Appendix Figure B11). The Anvik River sonar-based escapement count of 599,146 summer chum salmon was within the BEG range of 350,000 to 700,000 and was considered a minimum count based on water conditions at the sonar site in 2006. The estimated escapement of 101,465 summer chum salmon for East Fork Andreafsky River was within the BEG of 65,000–135,000. Spawning escapements were well above average in the Koyukuk and Tanana River drainages, and Salcha River escapement of approximately 112,000 fish was the second largest on record, with 2005 being the largest recorded. It appears escapement was lower than average for lower river spawning areas such as the Andreafsky and Anvik rivers, whereas escapement was much higher for spawning areas upstream of Anvik. Age and sex composition data collected from escapement projects in 2006 are presented in Appendix Table A10.

6.3 FALL CHUM SALMON

6.3.1 Alaska

The preliminary Yukon River drainage-wide escapement of 870,000 fall chum salmon is well above the drainage-wide escapement goal range of 300,000 to 600,000 fish. Although final assessments of overall run size, spawner distribution and age composition are not available at this time, preliminary assessments of run size can be made using several methods. Fishery management initially places a considerable amount of weight on the Pilot Station sonar abundance estimate until upriver monitoring projects can provide data. The preliminary fall chum salmon passage estimate, based on Pilot Station sonar for the period July 19 through August 31, was 790,563 fish (SE 38,125) (Appendix Table A2; Figure 3). One method to determine total run size is based on the Pilot Station sonar abundance estimate with the addition of estimated commercial and subsistence harvests downstream of the sonar site, including test fisheries (approximately 140,000 fish), and an estimated 5 % for fall chum salmon that pass into the river after termination of the project (August 31). Therefore, the preliminary total run size for the Yukon River drainage, primarily calculated from the main river sonar at Pilot Station, is estimated to be approximately 970,000 fall chum salmon. Based on the location of the project, in this case, Pilot Station (river mile 123), the abundance estimate includes Koyukuk River drainage stocks.

A second method to calculate run size is by using the individually monitored systems in the upper Yukon and Tanana River including the estimated U.S. and Canadian harvests. For 2006, this method results in a preliminary estimate of 1,135,000 fall chum salmon. This method however does not include escapement estimate of approximately 25,000 for stocks located in tributaries downstream of the confluence of the Tanana River such as in the Koyukuk River. This years estimates for the U.S./Canada border were provided by two methods: 1) the border mark–recapture project, and 2) Eagle sonar project. Both estimates appeared very similar for this first year of evaluation. The estimate of run size based on individual projects is typically higher than that based on Pilot Station sonar. The estimated escapement based on individual projects minus appropriate harvests is within the preseason projection based on normal production rates.

The 2006 fall chum salmon run resulted in the second highest return of age-5 fish since collections began in 1977, with 1992 being the only higher year. The run was dominated by age-5 fish as was expected due to the odd-even cycle of fall chum salmon and the exceptional run of age-4 fish observed the previous year. This was also only the second time in history that an even-numbered year returned 1 million fish, the first being in 1996. The summer and fall chum salmon runs are split by a calendar date (July 15, at the mouth of the Yukon River), where overlap is known to occur. In 2006, the first pulse occurred at the transition date. Thereafter, the run is characterized by a strong pulse during the first quartile (July 29) followed by a substantial pulse on August 12, and another peak occurring on August 19, resulting in average run timing overall. Pilot Station sonar operations only detected three substantial pulses of fish in 2006, with one smaller pulse detected at the end of the run, whereas projects downstream (Mt. Village drift test fish) and upstream (Kaltag drift test fish and two fish wheels on the mainstem Tanana River) detected additional strength at the end of the run. On August 29, a substantial pulse passed Mt. Village. The low magnitude of the last pulse, as detected by Pilot station sonar in combination with genetic stock identification results, caused the Tanana River stocks to appear weaker than was anticipated and as a result, corresponding management actions were taken.

The strength of the return appeared to benefit most stocks in both the upper Yukon River (non-Tanana) and Tanana River run components; however there still appeared to be some weakness in the Porcupine River system. All areas monitored that have Biological Escapement Goals (BEG) were exceeded. Weakness in the Fishing Branch River was anticipated and the interim goal was established at 28,000 fish preseason. The weir passage was approximately 30,849 fish.

The Chandalar River sonar project ran from August 8 through September 26, 2006. The preliminary escapement estimate was approximately 245,090 fall chum salmon, approximately 45% higher than the 1996–2005 average of 168,657 fish. Chandalar River sonar estimates of fall chum salmon range from a low of 65,894 fish in 2000, to a high of 496,484 fish in 2005. High water interrupted counting for 8 days on both banks, and 22 days total on the right bank. The ratio estimator method was used to predict the missing counts for the right bank when the left bank was still operational. When both banks were down counts were interpolated. The 2006 estimated escapement in the Chandalar River was 61% above the upper end of the BEG range of 74,000 to 152,000 fall chum salmon (Appendix Table B13; Appendix Figure B12).

The Sheenjek River sonar project operated from August 9 through September 24, 2006. For the 47-day period of operation, the cumulative count at termination was approximately 160,178 chum salmon. As in 2005, the Sheenjek River project was operated by using Dual-Frequency Identification Sonar (DIDSON™), which was operated on both right and left banks. The project experienced a high water event between August 20–31 which represents the early portion of the run and extrapolations had to be made for the right bank. It was observed prior to total shut down the fish began cutting the corner and primarily migrated on the right bank as the water levels rose. Once the water level receded and left bank operations were once again deployed, 29% of the passage was occurring at that location. However, passage increased up to 53% on the left bank through the later half of the run. Overall, not including the days operations were compromised by high water, the left bank represented 38% of the cumulative passage estimate. The right bank estimate of escapement was only 5% higher than the upper end of the BEG range of 50,000 to 104,000 fall chum salmon. Historical Sheenjek River escapement estimates, most of which only estimated from the right bank, ranged from 14,229 in 1999 to 246,889 fall chum salmon in 1996, with the high of 438,253 fish observed on both banks in 2005 (Appendix Table B13; Appendix Figure B12).

The Eagle sonar was operated for the first time into the fall season enumerating chum salmon. The estimate of 236,386 fall chum salmon can be used as a surrogate for the U.S./Canada Border passage estimate after exclusion of the harvests from the community of Eagle. The preliminary subsistence harvest for all of Eagle residents is estimated to be approximately 17,000 fish, resulting in a preliminary border passage estimate of 219,386 fall chum salmon. The estimated border passage, based on the DFO mark–recapture project is 217,810 fall chum salmon and is approximately 1.7 times higher than the mainstem goal of greater than 80,000 fall chum salmon. Overall the relative contribution of Canadian origin stock represents approximately 28% to the total run.

The 2006 inseason monitoring of the Tanana River drainage consisted of estimating fall chum salmon run abundance from mark–recapture techniques (Section 7.1.5). Two population estimates were generated, one for the Kantishna River drainage (approximately 71,000 fish) and one for the upper Tanana River drainage (approximately 202,000 fish). The Tanana River established BEG range of 61,000 to 136,000 includes the Toklat River index areas BEG range of 15,000 to 33,000 fall chum salmon. To represent the upper Tanana River, the Toklat River range is subtracted out leaving a BEG range of 46,000 to 103,000 fall chum salmon used to compare with the mark–recapture estimate. In 2006, estimate of fall chum salmon abundance in the upper Tanana River was 96% higher than the upper end of the goal.

The Toklat River, a tributary of the Kantishna River, is an important fall chum salmon spawning area within the Kantishna River drainage and has represented on average 36% of the Kantishna River estimate. The estimate of abundance of fall chum salmon in the Toklat River based on migratory time-density curves applied to a single ground survey of the index area typically conducted in October was discontinued in 2006. One aerial survey of the Toklat River was attempted on November 2 but only 1,931 live fish and 33 chum salmon carcasses were counted before having to vacate the area due to inclement weather. The 2006 combined population estimates for the Tanana River, minus appropriate harvests, is approximately 226,000 fish which is 66% higher than the upper end of the BEG range of 61,000 to 136,000 fall chum salmon. Overall the relative contribution of Tanana River stock represents 30% to the total run in 2006 (Appendix Figure B12).

The Delta River, in the upper Tanana River drainage, has a BEG range of 6,000 to 13,000 fall chum salmon. Evaluation of returns to the Delta River in 2006 was based on eight replicate foot surveys conducted between October 6 and November 30. The Delta River escapement was estimated to be 14,055 fall chum salmon based on the area under the curve method. This level of escapement was slightly higher than the upper end of the BEG range (Appendix Figure B12).

6.3.2 Canada

The preliminary fall chum salmon spawning escapement estimate based on mark–recapture data is 211,193 fish. Details are presented in Section 7.2.1.2. This is the second highest chum spawning escapement estimate on record and is 71% above the previous 10-year average of 123,315 chum salmon (including the 2005 record 437,733 chum estimate).

Aerial surveys of the Kluane and mainstem Yukon index areas were both conducted on October 16th and the Teslin River index area was surveyed on October 30th. All survey dates were approximately 1 week earlier than the dates these surveys were conducted prior to 2003. The timing of surveys in recent years appeared to occur after the peak spawning period; therefore, the 2003 though 2006 survey dates were advanced to better correspond with the peak spawning. The Kluane and mainstem Yukon survey areas both involve a large number of discrete spawning areas (sloughs and side channels) with a range from low to high numbers of fish. In contrast, the Teslin River index area is a single spawning area, which usually involves a low number of fish.

The Kluane River index count was 18,208 fish, 33.2% higher than the 1996–2005 average of 13,666 fall chum salmon. A record count of 39,347 fall chum salmon was observed in 2003 in an aerial survey database going back to 1973. The count of the mainstem Yukon River index was 6,553 fall chum salmon, 26.4% higher than the average count of 5,185 fish for the 1996–2005 period. The Teslin River index count was 620 fish, approximately 2.8 times higher than the 1996–2005 average count of 219 fall chum salmon. Historical data are presented in Appendix Table B13 and Appendix Figures B13 and B14.

In the Porcupine River drainage, the Fishing Branch River weir count of 21,942 fall chum salmon to October 14 was adjusted to a total of 30,849 fall chum salmon. It was necessary to adjust the weir count because high water conditions delayed weir installation and made the structure inoperable for a protracted length time during the peak of the run. The adjusted count (30,849) is 90.1% of the 1996–2005 average of 34,220 fall chum salmon, but is approximately 10% above the escapement target of 28,000 fall chum salmon established for 2006. Details of the 2006 weir operation are presented in Section 7.2.6. In 2005, the Fishing Branch River count exceeded the upper end of the interim escapement goal range of 50,000 to 120,000 fall chum salmon for the first since 1975.

7.0 PROJECT SUMMARIES

7.1 ALASKA

7.1.1 Pilot Station Sonar

The goal of the Yukon River sonar project at Pilot Station is to estimate the daily upstream passage of Chinook and chum salmon. The project has been in operation since 1986. Sonar equipment is used to estimate total fish passage, and CPUE from the drift gillnet test fishing portion of the project is used to estimate species composition.

Prior to 1993, ADF&G used dual-beam sonar equipment that operated at 420 kHz. In 1993, ADF&G changed the existing sonar equipment to operate at a frequency of 120 kHz to allow greater ensonification range and to minimize signal loss. The newly configured equipment's performance was verified using standard acoustic targets in the field in 1993. Use of lower frequency equipment increased fish detection at long range.

Up until 1995, ADF&G attempted to identify direction of travel of detected targets by aiming the acoustic beam at an upstream or downstream angle relative to fish travel. This technique was discontinued in 1995. Significant enhancements that year included refinements to the species apportionment process and implementation of an aiming strategy designed to consistently maximize fish detection. Because of these changes in methodology, data collected from 1995 to 2006 are not directly comparable to previous years.

In 2001, the equipment was changed from the dual beam to the current split-beam sonar system. This technology allows better testing of assumptions about direction of travel and vertical distribution.

Early in the 2005 season, the Yukon River experienced high water levels and erosion in the river bottom profile, which, along with a combination of changes in fish movement and distribution, affected detection of fish with the split beam sonar within 20m of shore on the left (south) bank. On June 19, a Dual Frequency Identification Sonar (DIDSON™) was deployed in this area to supplement estimates generated with the split-beam sonar. With its wider beam angle, the DIDSON™ system was able to detect fish passage within 20m despite high water levels and problematic erosion nearshore, and was operated for the remainder of the season (Figure 4).

In 2006, the DIDSON™ was integrated into the sampling routine on left bank for the whole season, operating side-by-side with the split-beam sonar. The DIDSON™ sampled the first 20m offshore; the remainder of the 250m range was sampled by the split-beam. The DIDSON™ estimates accounted for 28% of Chinook, 27% of summer chum, and 16% of fall chum total passage estimates, which was similar to the contribution seen in 2005.

Though proportions of passage detected nearshore with the DIDSON™ were significant in 2005 and 2006, the left bank had been monitored in previous years and the profile and fish distributions did not appear to be as problematic prior to 2005. Therefore, estimates for fish passage prior to 2005 have not been adjusted or changed. The DIDSON™ was also deployed on the right bank in 2005 as an assessment of nearshore detection, and the counts were comparable to those obtained with the split-beam. This was an expected result because the rocky, stable substrate on the right bank has maintained a consistently good profile throughout the project's history.

Fish passage estimates at Pilot Station are based upon a sampling design in which sonar equipment is operated daily in three 3 h intervals, and drift gillnets are fished twice each day between sonar periods to apportion the sonar counts to species. During most seasons, on designated days, the sonar sampling period is expanded to a 24 h period as a simple qualitative assessment to compare the estimates obtained in the 3 h intervals with those found when the sonar runs continuously. Results of these 24 h sonar periods have historically shown relatively close agreement with the established three 3 h sampling schedule. In 2006, continuous 24 h sonar periods were not sampled due to budget constraints and scheduling conflicts with commercial fishing openers, but all other standard methods of qualitative assessment of the sonar systems were employed.

The 2006 season was characterized by a late break-up of the Yukon, with ice jamming at the Andreafsky River causing a delay in sonar camp set-up. However, the right bank sonar was operating from June 4, and sonar was running without any significant data loss on both banks from June 10 through August 31, 2006. Test fishing began on June 3, 3 days before the first Chinook was caught at the Pilot Station camp.

An assortment of gillnets, 25 fathoms long with mesh sizes ranging from 7.0 cm to 21.6 cm (2.75 in to 8.5 in), were drifted through the sonar sampling areas twice daily between sonar data collection periods. Drift gillnetting resulted in a catch of 10,977 fish during the 2006 season, including 557 Chinook salmon, 5,403 summer chum salmon, 2,559 fall chum salmon, 658 coho salmon, and 1,802 other species. Chinook salmon were sampled for age, sex and length, and genetic samples were taken from both Chinook and chum salmon. Any captured fish that were not successfully released alive were distributed daily to nearby residents in Pilot Station.

The left bank substrate continued to be unstable throughout most of the summer, with the cutbank advancing past the region where the transducer was typically deployed in previous years. In 2005, the transducer was located approximately 50m downstream of the 2004 deployment site, to the limits of the cabling. To alleviate this problem in 2006, the left bank sonar site was relocated approximately 200m downstream where suitable profiles were found and deployment options were increased. As in previous years, the right bank deployment site was consistently stable.

The 2006 passage estimates for Pilot Station are 169,403 Chinook; 3,767,044 summer chum; 790,563 fall chum; 131,919 coho; and 875,899 other species. Detailed historical passage estimates for 1995 and 1997–2006, are listed in Appendix Table A2. Historical passage estimates were revised in 2006 using the most current apportionment model to allow direct comparison between the years 1995 and 1997–2006.

7.1.2 Yukon River Chinook Salmon Stock Identification

Scale pattern analysis, age composition estimates, and geographic distribution of harvests has been used by ADF&G on an annual basis from 1981 through 2003 to estimate stock composition of Chinook salmon in Yukon River harvests. Three region-of-origin groupings of Chinook salmon, or stock groups, have been identified within the Yukon River drainage. The lower and middle stock groups spawn in Alaska and the upper stock group spawns in Canada.

Beginning in 2004, genetic analysis replaced scale pattern analysis as the primary method for stock identification. Tissue samples were collected from fish in mixed stock harvests from Districts 1 through 5 and paired with age data. Genetic analysis was performed on these samples by age group, age-1.3 and -1.4; and results from these analyses were combined with specific harvest age composition to provide stock composition by harvest. Age groups not used for genetic analysis, age-1.1, -1.2, -2.2, -2.3, -2.4, -1.5, -1.6, and -2.5, were apportioned to stock groups using stock composition of analogous age groups, harvest age composition, and escapement age composition. Harvests from the Tanana River, the upper Koyukuk River, and Alaskan tributaries upstream from the confluence of the Yukon and Tanana rivers were assigned to the middle stock group based on geographic location. Harvests occurring in Fort Yukon and above were assigned to the upper stock group under the assumption these fish were bound for Canada.

The historical proportion by stock group in the total drainage wide Chinook salmon harvest (U.S. and Canada) is presented in Appendix Table A11. All fish from the lower and middle stock groups were harvested only in Alaskan fisheries. Analysis from 2005 shows drainage wide harvest proportions were: 0.207 from the lower stock group, 0.214 from the middle stock group, 0.464 from the upper stock group in Alaska, 0.115 from the upper stock group in Canada, and 0.579 from the upper stock group total (Appendix Table A11). Comparing 2005 proportions of harvested salmon to the average proportions (1981–2004), the representation of the lower stock group was average, the middle was slightly less, and the upper stock group was slightly more represented.

The Alaskan harvest proportion of fish attributed to lower, middle, and upper river stock groups is shown in Appendix Table A12. In 2005, the Alaskan harvest proportions from the lower, middle and upper stock groups were 0.234, 0.242, and 0.524, respectively (Appendix Table A12). Comparing 2005 Alaskan proportions with the average proportions (1981–2004) the lower and middle stock groups were slightly less and the upper stock group was slightly more represented.

The harvest proportion of the upper river stock group harvested in Alaskan and Canadian fisheries is shown in Appendix Table A13. The 2005 proportion of the upper river stock group harvested in Alaska and Canada were 0.801 and 0.199, respectively (Appendix Table A13). Comparing these 2005 proportions to the 1981–2004 average, the Alaskan proportion was slightly below average and the Canadian proportion was slightly above average.

7.1.3 Lower Yukon River Chinook and Chum Salmon Genetic Sampling

7.1.3.1 Chinook salmon

During 2006, field crews collected tissue samples (axillary processes preserved in ethanol) from Chinook salmon harvested by subsistence and commercial fisheries in the U.S. portion of the Yukon River. Tissue collections consisted of 1,801 samples from the subsistence harvest in Districts 1, 4, and 5 and 3,939 samples from the commercial harvest in Districts 1, 2, 3, and 5. No sampling of the test fishery at Emmonak was conducted during the 2006 field season. However, 278 Chinook salmon were sampled from nets at the Eagle sonar site.

ADF&G in cooperation with US Fish and Wildlife Service (USFWS) collected paired data at Pilot Station from 556 Chinook salmon samples during the 2006 field season. Baseline samples from spawning Chinook salmon in the Sheenjek River were collected by field crews from the Council of Athabascan Tribal Governments. These samples, combined with previous collections from the Sheenjek, were used to augment the baseline in 2006. Additional samples from the upper U.S. portion of the Yukon River drainage are needed to close gaps in the present genetic baseline.

The baseline of 18 single nucleotide polymorphism (SNP) markers that was used to estimate the stock composition of the 2004 fishery harvests is in the process of being augmented with more markers for providing stock composition estimates on fishery samples collected in 2006.

7.1.3.2 Chum salmon

ADF&G in cooperation with USFWS collected paired data at Pilot Station from 4,308 chum salmon samples during the 2006 field season. The Pilot Station samples were collected from June 27 to late August from the species apportionment gillnetting at the Pilot Station sonar site.

Pilot Station samples will complement the previous sampling over the 6-year span from 1999–2005. These 4,308 axillary process tissues are archived in ethanol at the USFWS laboratory and a DNA subset will be shared with ADF&G Gene Conservation Laboratory for future genetic stock identification. In addition, 225 chum salmon were sampled from fish passing the Eagle sonar site. The baseline of SNP information from Yukon River chum salmon populations was increased to 24 populations surveyed for 51 SNPs developed for use in western Alaska.

7.1.4 Yukon River Chum Salmon Mixed-Stock Analysis

Since 2004, the stock compositions of chum salmon have been estimated from samples collected from Pilot Station sonar test fisheries for the period spanning July 1 through August 31. A baseline of standardized data collected at 21 microsatellite loci was constructed from the following stocks: Andreafsky River (N=261), Chulinak River (N=100), Anvik River (N=100), Nulato River (N=100), Gisasa River (N=200), Henshaw River (N=200), South Fork Koyukuk River (N=200), Jim Creek (N=160), Melozitna River (N=146), Tozitna River (N=200), Chena River (N=172), Salcha River (N=185), Big Salt River (N=71), Kantishna River (N=161), Toklat River (N=192), Delta River (N=80), Chandalar River (N=338), Sheenjek River (N=263), Black River (N=112), Fishing Branch (N=481), Big Creek (N=200), Minto River (N=166), Pelly River (N=84), Tatchun River (N=175), Kluane River (N=462), Donjek River (N=72), and Teslin River (N=143). Results from this analysis were reported for each pulse or time strata and distributed by email to fishery managers within 24–48 hours of receiving the samples. Stock abundance estimates were derived by combining the sonar passage estimates with the stock composition estimates. To evaluate the concordance of various data sources, an analysis was conducted to compare these stock specific abundance estimates against escapement and harvest estimates. This analysis revealed that the data were concordant for 2004 and 2005. Data analysis for 2006 is ongoing, and preparations are underway to continue the project for the 2007 season.

7.1.5 Tanana and Kantishna River Fall Chum Salmon Mark–Recapture Study

A cooperative fall chum salmon mark–recapture project was initiated in 1995 on the Tanana River, and it has operated annually through 2006. Western Alaska Disaster Relief Grant (WADG) funds were provided to the AYK region because of poor salmon runs in Western Alaska in 1997 and 1998. In 1999, WADG funding was used to expand the scope of the project and begin a fall chum mark–recapture study on the Kantishna River (Cleary and Bromaghin, 2001). Although funding sources have changed, sufficient financial support for the project has assisted operation of fall chum mark–recapture studies on both the Tanana and Kantishna River. Present cooperators include the Bering Sea Fishermen's Association, the National Park Service and the Yukon River Drainage Fisheries Association.

The objectives for the 2006 season were to: 1) provide inseason and postseason abundance estimates of fall chum in the Tanana River (above the mouth of the Kantishna River) and Kantishna River; 2) estimate migration rates of fall chum in the Kantishna River drainage; 3) count tagged and untagged fall chum and other species using digital video at the Tanana tag recovery wheel near Nenana; and 4) estimate run timing in Kantishna drainage.

In the Tanana River, tags were deployed from a fish wheel approximately 9 km upstream of the Kantishna River mouth and recovered (counted using digital video) 73 km upstream. In the Kantishna River, tags were deployed from a fish wheel on the lower Kantishna River and recovered at two sites each with two fish wheels on opposite banks. One site was 89 km upstream on the Toklat River and the second was 148 km upstream on the upper Kantishna

River. All fish wheels began operation on 16 August and continued for approximately 6 weeks. A total of 3,270 chum salmon were tagged in the Tanana River and 3,217 were tagged in the Kantishna River. The Tanana River tag recovery fish wheel catch was 12,665 chum salmon of which 194 tagged. In the Toklat River recovery fish wheels a total of 5,905 chum salmon were captured of which 270 were tagged (both wheels combined). In the upper Kantishna River, 891 chum salmon were captured of which 38 were tagged (both wheels combined). Preliminary fall chum abundance estimates are 202,669 (SE=16,545) for the Tanana River and 71,135 (SE=4,972) fall chum for the Kantishna River. Both estimates of fall chum abundance are above the long-term average for their respective drainages.

Eight foot surveys of the Delta River were conducted during October and November 2006. The fall chum abundance estimate of 14,055 fish in the Delta River was determined based on the "area under the curve" method. During the weekly surveys, 73 tags were observed on fish that were unrecoverable and throughout the course of the surveys 41 tags were recovered. Age, sex and length data was collected from fall chum in the Delta, Toklat, Chandalar, and Sheenjek River escapements in 2006.

7.1.6 *Ichthyophonus*

A JTC *Ichthyophonus* Subcommittee was established at the February 20–22, 2002 JTC meeting in Anchorage. The subcommittee was formed to develop research recommendations to support individual researchers with project design and to prioritize goals for *Ichthyophonus* research in the Yukon River drainage for the years ahead. The Yukon River Drainage Fisheries Association (YRDFA) hosted a meeting in October 2004 to discuss *Ichthyophonus* research goals, at which time YRDFA assumed leadership of future meetings, however, with ADF&G's continued participation. A Sustainable Fisheries Grant from the National Oceanic and Atmospheric Administration was awarded to ADF&G to conduct *Ichthyophonus* research. Additionally, Treaty Implementation funding has been used to supplement completion of data collection and report writing.

Ichthyophonus is a protozoan parasite of marine and anadromous fishes with a global distribution (McVicar 1982; Woo and Bruno 1999). The current taxonomic position of *Ichthyophonus* is in the class Mesomycetozoea, a highly diverse class that includes other difficult to categorize organisms having characteristics of both animals and fungi (Mondoza et al. 2002). The infection is systemic within salmon, infecting the muscle, heart, kidney, spleen, and other vascular organs.

Ichthyophonus was first identified in Chinook salmon within the Yukon River drainage in 1988 (Anchorage Fish Pathology Laboratory, Disease History Database, June 1988). Approximately 25 other locations within Alaska have also been determined to have Chinook salmon infected with *Ichthyophonus*, as well as other species, such as sockeye and coho salmon. A pilot study conducted in 1999 indicated approximately 30% of the Chinook salmon sampled in the lower Yukon River in late June were infected with *Ichthyophonus*. Samples of Chinook salmon at south side Tanana village showed significant increases in disease severity as they moved upstream (Kocan and Hershberger 1999). Research on the effects of *Ichthyophonus* on Yukon River Chinook salmon has been conducted annually since 1999 (Kocan et al. 2003). ADF&G studies in 2004 suggest that high infection rates observed at this location and differences between genders at the Tanana site were possibly a function of selection for fish by gear type (Kahler et al. *In prep*).

During the 2006 field season, approximately 533 Chinook salmon were sampled from three locations, the lower Yukon in Emmonak, as the fish entered the river and on the spawning grounds of both the Chena and Salcha Rivers. Heart tissue samples from all sites were tested by both culture and PCR methods. The spawning ground samples were collected based on the criteria, clear eyes and some red/pink color in the gills.

The 2006 results based on heart culture indicated the infection prevalence was higher in the lower river at 16% and decreased slightly on the spawning grounds to 12% (Table 1). In contrast, samples taken in 2004 indicated 22% prevalence in Emmonak and mixed infection prevalence on the spawning grounds. During 2005, infection prevalence in Emmonak was 24%, similar to the previous year, and approximately 14% on the spawning grounds. The 2006 infection prevalence in the Chena and Salcha Rivers was 12.8% and 11.4%, respectively. As described in other studies (e.g., Kocan et al. 2003) clinical signs of the disease become more prominent as the fish migrate up river and the organism spreads throughout the body. Infection prevalence by gender was not statistically significantly in 2004 through 2006 at Emmonak or on the spawning grounds. Difference by gender was only significant in 2004 at the Tanana site where a fish wheel was used for collecting samples thereby introducing a gear bias.

Table 1.–Preliminary results from Chinook salmon sampled for *Ichthyophonus* in 2006, by test methodology, Yukon Area.

	Heart Culture			Heart PCR		
Sample Site	Sample Size	Number of Positives	Percent Infected	Sample Size	Number of Positives	Percent Infected
Emmonak	104	17	16%	104	13	13%
Chena River	163	21	13%	169	19	11%
Salcha River	244	28	11%	260	29	11%

As in 2004 and 2005, spawning success was evaluated for males and females based on 3 established categories, i.e., spawned out, partially spawned, and did not spawn. Preliminary results based on spawn-out classes of both infected and uninfected individuals in 2004 and 2005 suggest that Chinook salmon counted past escapement enumeration projects are spawning successfully. Results for female Chinook salmon collected on both the Chena and Salcha River spawning grounds in 2006 are presented in Table 2. The 2006 samples resulted in a marginal difference between infected and uninfected fish in the spawned out and partially spawned categories for the Chena River. However, samples sizes for infected fish are small as 2006 had the lowest infection prevalence for this 3-year study (JTC 2006a).

Table 2.–Preliminary results of infection prevalence by spawn out category for female Chinook salmon sampled for *Ichthyophonus* on the spawning grounds in 2006, Yukon Area.

	Infected		Uninfected	
Spawn Out Category	Sample Size	Infection Rate	Sample Size	Infection Rate
Spawned Out	21	78%	171	94%
Partially Spawned	5	19%	8	4%
Did Not Spawn	1	4%	2	1%
Total Sampled	27		181	

Other factors of importance for any *Ichthyophonus* monitoring program include that all samples should be paired with age, sex, and length data for each individual specimen and that water temperatures should be collected annually at the Yukon River mouth and key spawning tributaries, such as the Chena and Salcha rivers. Okamoto et al. (1987) found that the mortality rate of *Ichthyophonus* infected rainbow trout significantly increased at temperatures above 15ºC. Temperatures above this range were observed in 2004 in the Chena and Salcha rivers. It is conceivable, that a combination of high water temperatures and high infection prevalence may have an impact on spawning success. Fieldwork for ADF&G's study is concluded and the work is currently concentrated on data analysis and report writing with a goal for report completion by June 30, 2007.

7.1.7 Eagle Sonar

In 2003, ADF&G began investigating the feasibility of using sonar to estimate Chinook and fall chum salmon passage in the Yukon River near the Alaska/Canada Border. This effort was initiated in response to concerns about the current assessment methodologies and the importance of accurate border passage information when reviewing whether the annual objectives of the United States/Canada salmon treaties have been met. A suitable section of river was identified near Eagle, Alaska for a potential sonar project. In 2004, ADF&G carried out a 2-week study to evaluate the performance of sonar at two preferred sites, Calico Bluff and Six-Mile Bend (Carroll et al. *In press*). It was found that Six-Mile Bend was the preferred site, that a Dual Frequency Identification Sonar (DIDSON™) should be deployed on the shorter, steeper right bank, and a split-beam unit should be deployed on the longer, more linear left bank.

A full-scale project was initiated at Six-Mile Bend in 2005 to estimate Chinook passage. Sonar equipment was deployed on both banks at the site and the project was operational from July 12 to August 10, 2005. The passage estimate for 2005 was 81,528 Chinook salmon. The split-beam and DIDSON™ systems performed well over the entire season with no technical difficulties or malfunctions. The DIDSON™ was the ideal system for the right bank, where the profile is steep and less linear than the left bank. The split-beam system worked well on the left bank and appeared to have a satisfactory detection rate nearshore, while still adequately detecting targets out to 150 m.

In 2006 both Chinook and fall chum salmon passage were estimated at the same location, and with the same equipment. Estimated Chinook salmon passage from July 8–August 17 was 73,691, while 236,386 fall chum were estimated between August 18 and October 6. Again, both sonar systems worked well at this location.

In addition to operating the sonar, a drift gillnet program was initiated in the same section of river to gain a better understanding of species composition, behavior and spatial distribution of the fish passing the sonar site. Standard age, sex and length (ASL) data, and genetic samples were collected from captured Chinook and chum salmon. Six gillnets, 25 fathoms in length and with mesh sizes ranging from 2.75" to 8.5", were fished in an effort to effectively capture all size classes of fish present and detectable by the hydroacoustic equipment. Set nets were also deployed with varied results to investigate nearshore passage.

Though there are some chum salmon present in the river during the Chinook run and vice versa, Chinook and chum salmon runs appear to be largely discrete in time based on test fish results, local knowledge of catches, data collected in Canada, and past projects in the area. Chum salmon and non-salmon species such as whitefish are locally known to migrate near shore, and based on test fish results and information collected by the sonar this appears to be true. Information from the DIDSON™ also suggests that other species such as whitefish appear to be present in small numbers (10%). A preliminary examination shows that the split-beam sonar is only detecting 50% of the smaller non-salmon species, leaving only 5% non-salmon counted as salmon, so it is unlikely they would affect the utility of the Chinook and chum salmon estimates.

7.1.8 Sheenjek River Sonar

The Sheenjek River sonar project has estimated fall chum salmon escapement since 1981 and has undergone a number of changes in recent years. The project originally operated Bendix single-beam sonar equipment and, although the Bendix sonar functioned well, the manufacturer ceased production in the mid 1990s and no longer supports the system. In 2000, ADF&G purchased an HTI model 241 split-beam digital echosounder system for use on the Sheenjek River to continue providing the best possible data to fishery managers. In 2000 and 2002, the new system was deployed alongside the existing single-beam sonar and it produced results comparable to the Bendix equipment (Dunbar 2004). In 2003 and 2004, the split-beam sonar system was used exclusively to enumerate chum salmon in the Sheenjek River.

In 2002, ADF&G began testing a new Dual Frequency Identification Sonar (DIDSON™) for counting salmon in small rivers. Based on the results of these tests, which showed this equipment to be easier to use, more accurate, and capable of operating with substrate profiles that are unacceptable for split-beam systems (Maxwell and Gove 2004), the Sheenjek River was selected as an ideal candidate for this system. In 2004, the project began transitioning to DIDSON™, and in preparation, it was operated side-by-side with the split-beam sonar on the right bank. The DIDSON™ produced an estimate 29% greater than the split-beam system during this initial testing.

Because of the large discrepancy with the side-by-side comparison in 2004, the DIDSON™ was again operated next to the split-beam in 2005. For the 2005 study, the DIDSON™ produced an estimate 18% larger than the split-beam on the right bank over the period August 18 through September 5. The split-beam sonar was operated at a constant slow ping-rate throughout the season, which resulted in lower detection rates after September 5, when chum salmon were observed swimming noticeably faster. This happened to coincide with peak passage for the Sheenjek River, with data collected after September 5 included, the right bank DIDSON™ count was 32% higher than the split-beam. It is unlikely that the late-season data is representative of the typical relationship since the ping-rate was lower than usual.

Historically, due to unfavorable conditions for transducer placement on the left bank, only the right bank of the Sheenjek River has been used to estimate fish passage. Drift gillnet studies in the early 1980’s suggested that distribution of the upstream migrant chum salmon was primarily concentrated on the right bank of the river at the sonar site, with only a small but unknown proportion passing on the left bank (Barton 1985). In 2003, a DIDSON™ was deployed on the left bank to better understand the distribution of migrating chum salmon. Results showed that approximately 33% of the fish were migrating up the left bank. Due to large numbers of fish observed on the left bank, ADF&G began operating DIDSON™ on both banks in 2005.

The 2005 season marked a successful transition from a single split-beam system on the right bank to DIDSON™ systems deployed on both banks. The new equipment was both easier to use and produced more accurate estimates. The combined passage estimate for both banks was

438,253 chum salmon, with an estimate for the right bank alone of 266,962 chum salmon. In 2005, the left bank estimate represented 39% of the total passage.

In 2006, the combined passage estimate for both banks was 160,178 chum salmon, with an estimate for the right bank alone of 106,397 chum salmon. This estimate was adjusted for an 11-day period when the sonar was not operational because of a flooding situation. The left bank estimate represented 34% (including interpolated flood period) to 39% (excluding flood period) of the total passage. It will take several more years of data collection to determine how best to treat the historical estimates, but in order to provide the best escapement number possible the left bank must continue to be monitored. The transition from split-beam to DIDSON™ has gone smoothly and this equipment will continue to provide accurate escapement estimates in future years.

7.1.9 Chinook Salmon Size Trends

Concerns over changing trends in the age, sex ratio, and size of Yukon River Chinook salmon populations have recently emerged. In response to these concerns, the JTC Salmon Size Subcommittee compiled relevant literature and existing analyses pertaining to these trends and potential causes of these trends in their Potential Causes of Size Trends in Yukon River Chinook Salmon Populations report (JTC 2006b). This informational summary was divided into six sections: history of the Alaskan Yukon River Chinook salmon harvest and fishery sampling, history of the Canadian Yukon River Chinook salmon harvest, summary of prior age, sex and size investigations, summary of Yukon River gillnet selectivity, heritability of traits and potential effects of selective fisheries, and oceanic influences on salmon size. There is some evidence that Yukon River Chinook salmon have undergone phenotypic alteration over time. Analyses document a decrease in the weight of commercial harvests (Bigler et al. 1996) and a reduction in the prevalence of the largest fish (Hyer and Schleusner 2005). Whether the changes observed within Yukon River Chinook salmon have resulted from environmental or fishery-induced selective pressures, or a combination of both, is difficult to determine with certainty. The report recognizes several factors that may contribute to these trends, including environmental changes in the Bering Sea and Gulf of Alaska, fishery induced selective pressures and increased competition in the ocean from large numbers of hatchery fish. The JTC Salmon Size Subcommittee is committed to continue monitoring of size and age trends in Yukon River Chinook salmon populations. They will use this summary report as a means to develop hypotheses for further study.

7.2 Canada

7.2.1 Upper Yukon River Salmon Tagging Program (Yukon Territory)

Fisheries and Oceans Canada has conducted a tagging program on salmon stocks in the Canadian section of the Upper Yukon River drainage since 1982 (excluding 1984). The objectives of this program are to provide inseason estimates of the border escapement of Chinook and fall chum salmon for management purposes and to provide postseason estimates of the total spawning escapements, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in two fish wheels located upstream from the Canada/US border. The two fish wheels, White Rock and Sheep Rock, are situated approximately 7 kilometers apart on the right bank of the river. With the exception of short periods for maintenance or repair, in 2006 both fish wheels ran 24 hours per day for an operational period that started in late June and ended in early October. Tagging methodology for many years involved two daily tagging events, morning and evening. In recent years, additional tagging shifts have been implemented for both the Chinook and fall chum salmon migration periods to reduce the time fish are held in the live-boxes prior to tagging. In 2006, Chinook salmon were tagged every 6 hours throughout most of the run while fall chum salmon were tagged three times per day (morning, afternoon and evening) throughout most of the run. Subsequent tag recoveries are made in a number of different fisheries located upstream and infrequently in downstream fisheries and spawning areas. Population estimates were developed in 2006 using spaghetti tag recoveries from the Canadian commercial fishery located downstream of the Stewart River, the area where most intensive fishing activity and catch monitoring is conducted.

Commercial fishers are legally required to report catches, tag recovery and associated data no later than 8 hours after the closure of each fishery and there is also a requirement that catch forms be either received by the Whitehorse office or post-marked within 10 business days after the closure of each commercial opening. A toll-free telephone catch line is available for catch reporting.

Consistency in the fish wheel sites and fishing methods permits some inter-annual and inseason comparisons, although the primary purpose of the fish wheels is to live-capture salmon for the mark–recapture program. Fish wheel catch data in the absence of recapture information is generally not useful to assess run abundance. Fish wheel counts have limited correlation with border escapement estimates derived from mark–recapture estimates, particularly with respect to the Chinook salmon run. Chinook salmon catches tend to be highest during high water conditions when the fish are most vulnerable to the shore-based gear and lower during low water conditions. Similarly, fall chum salmon fish wheel catches are often directly related to water levels rather than true abundance, although the fish wheels are highly efficient at capturing fall chum salmon, which migrate close to shore. The fish wheels appear to be less efficient during the latter part of the fall chum salmon migration period, late September and early October, when the Yukon River becomes less turbid. During this period most fish are caught overnight; there is an assumption that migrating fall chum salmon are better able to avoid the gear during the daylight hours due to an increase in water clarity associated with less turbid water conditions.

7.2.1.1 Chinook Salmon

The first Chinook salmon were caught in both the White Rock and Sheep Rock fish wheels on July 4, 6 days later than average. The combined total fish wheel catch of 1,231 Chinook salmon in 2006 was 74.0% of the 1996–2005 average of 1,663. The sex composition observed in the fish wheel catches was 27.8% female. A peak weekly catch of Chinook salmon (444) was recorded in statistical week 31, i.e., week ending August 5. As in previous years, the catch and tag recovery component of the Chinook salmon mark–recapture study used data from the Yukon River commercial fishery downstream of the Stewart River.

The preliminary border escapement estimate for 2006 is 36,748 Chinook salmon. This estimate was expanded from a point estimate of 29,509 Chinook through August 5 (95% confidence interval of 17,008 to 42,110 fish), using 2006 timing data from the DFO fish wheels. Very limited Chinook catch and tag recovery data after the August 4–7 commercial opening precluded using mark–recapture data after this point in time. Additional analyses of the mark–recapture data are still in progress. Preliminary information from the 2006 mark–recapture program suggests that total run size was consistent with the upper end of the preseason outlook. After subtracting the Upper Yukon harvest of 8,758 (2,332 commercial, 5,757 aboriginal, 63 domestic and 606 recreational), 27,990 Chinook salmon were estimated to have reached spawning areas. This estimate is very close to the escapement goal of 28,000 adopted by the Yukon Panel for the 2006 season (Appendix Table B11; Appendix Figure B15).

The postseason mark–recapture estimate is lower than the inseason run size projections. The reasons for this appear to be related to: a) an unexpected increase in the proportion of tags in the recapture sample later in the run; and b) an earlier than expected end to what was considered to be an overall late run.

Comparative border and spawning escapement estimates from the tagging program for 1982 through 2006 are presented in Appendix Table B11. The 2005 and 2006 border escapement estimates appear to be biased low when compared to estimates of Chinook salmon derived from the border sonar program located near the community of Eagle, Alaska. Additional years of paired data are required to compare the mark–recapture and sonar estimates before it can be determined if there is a systemic problem associated with the fish wheel tagging program that consistently biases the estimates low.

7.2.1.2 Fall Chum Salmon

The total fish wheel catch was 6,283 fall chum salmon, 28.5% higher than the 1996 to 2005 average of 4,888 fall chum salmon. The first fall chum salmon was captured at the White Rock fish wheel on July 26. On average during the previous 10 years, the first fall chum salmon has been captured July 21 (range July 6 to August 2). The midpoint of the fish wheel catch occurred on September 16. The average midpoint date over the previous 10 years occurred on September 12; however, the midpoint dates have been variable, ranging from September 5 to September 23. The peak weekly catch of fall chum salmon in 2006 (1,802 fish) occurred in statistical week 38 (September 17–23).

In 2006, 92% of the fall chum salmon captured in the DFO fish wheels were tagged with spaghetti tags. One of the tagged fish moved downstream and was recovered in the US fishery located near Eagle Alaska.

Catch and tag recovery information from the fall commercial fishery was used for the tag recovery component of the fall chum salmon mark–recapture program. The 2006 fall chum mark recapture data analysis involved a relatively low number of fish examined for tags (4,096) and a low number of tag recoveries (104). Numerous iterations involving temporal stratification were explored before a preliminary pooling of data was used. The preliminary 2006 Upper Yukon postseason border escapement estimate is 217,810 chum salmon with a 95% confidence interval range from 164,136 to 271,484 fish. After subtracting the estimated catch of 6,617 (4,096 commercial and 2,521 aboriginal), the estimated spawning escapement was 211,193 fall chum salmon. This estimate exceeded the rebuilding goal of >80,000 Upper Yukon fall chum salmon adopted by the Yukon Panel for 2006. Comparative border and spawning escapement estimates from the tagging program for 1980 through 2006 are presented in Appendix Table B13.

7.2.2 Big Salmon Sonar

A long range dual frequency identification sonar (DIDSON-LR) was used to enumerate the Chinook salmon return to the Big Salmon River in 2006, as well as run timing, and diel migration patterns. This was the second year a sonar program operated at this site with funding provided by the Yukon Panel's Restoration and Enhancement Fund. The sonar site was located on the Big Salmon River approximately 1.5km upstream of the Yukon River confluence, the same location used for the 2005 program. Partial weirs placed on both sides of the river were used to deflect fish movement through a 34m opening. The sonar unit was configured to provide a 29º conical ensonified field that was 40m wide and covered the water column within the fish passage opening.

A total of 7,308 (7,298 counted plus 10 extrapolated) targets identified as Chinook salmon was counted past the sonar station between July 15 and August 23, 2006. A peak daily migration of 496 fish occurred on August 5th, and 90% of the run had passed the station by August 12th. The cumulative daily run pattern exhibited a normal distribution. The 2006 run timing was approximately 3 days later than the 2005 run.

A carcass sampling program conducted over the total length of the Big Salmon River yielded 234 Chinook salmon carcass samples. Each carcass was sexed, and sampled for scales (age determination), length, tags, and DNA samples. Of the 234 fish sampled, 110 (47%) were male and 124 (53%) were female. The mean fork length of males and females sampled was 825 mm and 891 mm, respectively. Of the fish sampled, 90% were from the combined age-5 and age-6 age classes. A total of 7 spaghetti tags was collected.

7.2.3 Whitehorse Rapids Fishway Chinook Salmon Enumeration

A total of 1,720 Chinook salmon ascended the Whitehorse Rapids Fishway between July 20 and September 5, 2006. This total was 12.6% higher than the 1996–2005 average count of 1,527 fish (Appendix Table B11). The sex composition was 47.6% female (819 fish). Hatchery-produced fish accounted for 46.8% of the return: 503 males and 302 females. The non-hatchery count consisted of 398 wild males and 517 wild females. The run midpoint occurred on August 18 and the peak daily count occurred on August 20 when 158 fish were counted.

In 2006, Chinook salmon were not specifically removed from the fishway for coded-wire tag sampling, but several samples were obtained from the brood stock collected. No weirs (i.e., Wolf or Michie creeks) were operated in the drainage upstream of the fishway in 2006, although more effort was placed on the recovery of coded wire tags from Michie Creek and the M'Clintock River and some coded wire tags were recovered from Wolf Creek.

7.2.4 Whitehorse Hatchery Operations

All 156,779 fry from the 2005 Brood Year (BY) Chinook salmon reared at the Whitehorse Rapids Fish Hatchery were released between June 4 and June 14, 2006 (Appendix Table A14). The fry[4] were released into various locations upstream of the Whitehorse Rapids hydroelectric dam. The numbers of fry released and release location were as follows:

Wolf Creek:	42,876 fry
Michie Creek:	43,508 fry
M'Clintock River	35,059 fry
Mainstem Yukon River	35,336 fry
TOTAL	156,779 fry

[4] The juvenile fish released are referred to as fry, however virtually all of them emigrate to the ocean shortly after release, and they may more accurately be referred to as pre-smolts.

The 2006 release was the eleventh year, 1995–2005 Brood Years (BY), in which all fit fish released from the Whitehorse Rapids Fish Hatchery into the Yukon River were marked. With the exception of all fish released from the 1998 BY (1999 release year), which were adipose-clipped but not tagged, all of the fry releases from the 1995–2005 brood years involved adipose fin removal and application of coded wire tags to all fit fish; approximately 94% of the 1994 BY release was tagged with coded wire tags. The initiative to mark all hatchery releases has provided an opportunity to more accurately determine the contribution of hatchery-reared fish as they migrate through the Whitehorse Rapids Fishway and to allow a more selective brood stock program.

The total 2006 release of 156,779 fry included: an estimated 147,500 adipose-clipped fry with coded-wire tags (CWT); 1,621 fry which were estimated to have lost their tags (tag retention was calculated to be 98.9%) – these fish were adipose clipped; and 7,658 small (or assessed to be unfit) fish, which were adipose clipped but not coded wire tagged. The latter group was released into Wolf Creek on June 11, 2006.

The total 2006 Wolf Creek release was higher than usual. This resulted because Wolf Creek was the recipient of a slow growing group of fry, which was tagged during a second (later) tagging session. A developmental problem associated with some fry was attributed to the fish food used. This problem was also observed in other Chinook hatcheries using the same feed, however it did not seem to affect other species and the overall mortality rate for the Whitehorse Rapids Chinook salmon fry was low (Vano, personal communication). A summary of releases of Chinook salmon into the Upper Yukon River from instream incubation and rearing sites is presented in Appendix Table A15.

In August 2006, brood stock collection for the 2006 egg take began after 78 Chinook salmon had migrated through the Whitehorse Rapids Fishway. Brood stock was collected from August 10 to August 27. An attempt was made to collect two males for each female to allow matrix spawning. Matrix spawning has been used for 18 years in an attempt to maintain genetic diversity.

A total of 32 males was retained and used for the brood stock program; 10 of these fish had adipose clips (hatchery origin) and 22 had intact adipose fins (wild). An additional 37 hatchery males were collected from, and later returned to the fishway, for a total male brood stock of 69 fish. In total, 7.6% of the total male return of 901 through the fishway was used for the brood stock program.

A total of 34 females was used for brood stock including: 9 adipose-clipped (hatchery origin) fish; 19 fish which had intact adipose fins (wild fish). An additional 6 females (5 hatchery and 1 wild) were collected after they failed to migrate through the fishway. In total, 4.2% of the total female return of 819 through the fishway was used for the brood stock program. Egg takes began on 15 August and were completed on August 29. An estimated 189,764 green eggs were collected from the 34 females. Average fecundity was estimated at 5,581 eggs/female and the fertilization rate was estimated to be 99%. Shocking and taking of the second inventory of the eggs began on October 4 and was completed by October 14.

The eggs began to hatch on November 7 and hatching was completed by November 29, 2006 at an average Accumulated Thermal Unit (ATU) value of 545. An estimate of the number of alevins as of January 15, 2007 was 161,843. Approximately 160,000 fry were ponded in late January to early February 2007.

7.2.5 Porcupine River Investigations

7.2.5.1 Fishing Branch River Fall Chum Salmon Weir

Fall chum salmon returns to the Fishing Branch River have been assessed since 1971 when an aerial survey count of 115,000 was adjusted to a total estimated return of ~250,000 to 300,000. A weir established to enumerate fall chum salmon escapement to the Fishing Branch River has operated during the following periods: 1972 to 1975; 1985–1989; and, annually since 1991 when Fisheries and Oceans, Canada and the Vuntut Gwitchin Government (Vuntut Gwitchin First Nation) conducted the weir program cooperatively. Escapement estimates for the Fishing Branch River, including aerial expansions for years lacking complete weir counts, have ranged from approximately 5,100 chum salmon in 2000, to 353,300 chum salmon in 1975 (Appendix Table B13; Appendix Figure B14).

In 2006, the weir was in operation from September 2 to October 14, during which time a total of 21,942 chum salmon was counted. However, this was considered to be an incomplete count as a small portion of the run was known to have arrived prior to the installation of the weir and it was likely that many fish were not counted when the weir was breached for a protracted time period later in the run (September 24–October 2). Using the recent 10-year average timing data, the weir count was expanded by 1,509 fish to account for the fish missed early in the season. In addition, the weir count was adjusted by an additional 7,173 fish for a period of approximately 11 days during high water conditions using a linear relationship between the closest days having complete counts. These adjustments and some additional minor adjustments resulted in a final 2006 estimate of 30,849 fall chum salmon.

The peak daily count (1,848 chum salmon) occurred on September 17 and the midpoint of the run occurred on September 18. The expanded 2006 count (30,849) was 90.2% of the recent 10-year average of 34,220 chum salmon, but exceeded the escapement target of 28,000 chum salmon established for 2006.

Generally, a low number of coho salmon are observed at the weir each year. However, the weir is not in operation long enough to obtain quantitative information on coho salmon escapement. No coho salmon were counted during operation in 2006.

7.2.5.2 Porcupine River Fall Chum Salmon Mark–Recapture Program

A mark–recapture program, funded by the Yukon Panel’s Restoration and Enhancement Fund, was conducted on the Porcupine River near the community of Old Crow, Yukon, in 2006 by the Vuntut Gwitchin Government (VGG) and a consulting firm, Environmental Dynamics Incorporated (EDI). The purpose of this project was to continue the development of an inseason fall chum salmon management tool for the community of Old Crow and Fisheries and Oceans, Canada (DFO) fishery managers. It was hoped that inseason information from this program and the Fishing Branch River weir could be used to determine inseason harvest opportunities and promote conservation of the Fishing Branch chum salmon returns.

In 2006, 1,615 chum salmon were captured by gillnet, tagged, and released downstream of the community of Old Crow. A total of 578 chum salmon were caught in a test fishery of which 58 fish[5] were observed with tags. Weekly mark–recapture estimates were developed throughout this program as well as a total estimate of 15,858 (95% CI 12,115 to 19,600) (Table 3).

Table 3.–Estimation of the number of fall chum salmon at Old Crow Y.T. derived from a mark–recapture program.

Week	# Tagged	# Test	Tags Recovered	Chapman's Estimate	Var (Nc)	95% CI	95% Run Est (-)	95% Run Est (+)
1	5	0	0	5	0	0	5	5
2	143	14	0	2,159	2,162,160	2,889	-730	5,048
3	71	112	1	4,067	5,268,060	4,510	-443	8,577
4	320	73	9	2,374	429,818	1,288	1,086	3,663
5	357	103	10	3,384	827,489	1,787	1,596	5,171
6	501	206	31	3,246	252,928	988	2,258	4,235
7	218	70	7	1,943	358,842	1,177	766	3,120
Wk. 4-7 Total	1,396	452	57	10,910	1,686,414	2,552	8,358	13,462
Project Total	1,615	578	58	15,858	3,627,076	3,742	12,115	19,600

Note: These estimates include only the test fishery catch and tag recovery data. Weeks 4 through 7 were the only weeks during the project with sufficient number of recoveries to enable an MRP estimate.

One limitation of this program was the relatively low number of tag recoveries (n=58) observed in the test fishery catch. Since additional catch and tag recovery information was available from the aboriginal fishery centered in close proximity to the community of Old Crow, catch and tag recovery information from this fishery was added to the existing data and a second population estimate was calculated (Table 4). The combined data included an examined catch of 3,556 (578 test fishery catch and 2,978 aboriginal fishery catch) and 127 associated tag recoveries. The total estimate using the combined fishery data was 44,906 (95% CI 37,586 to 52,226) (Table 4).

Table 4.–Estimation of the number of fall chum salmon at Old Crow Y.T. derived from a mark–recapture program.

Week	# Tagged	# Test	Tags recovered	Chapman's Estimate	Var (Nc)	95% CI	95% Run Est (-)	95% Run Est (+)
1	5	0	0	0	0	2	0	0
2	143	14	0	0	2,162,160	2,889	-2,889	2,889
3	71	112	1	4,067	5,268,060	4,510	-443	8,577
4	320	986	38	8,123	1,382,164	2,319	5,804	10,441
5	357	748	17	14,896	10,825,863	6,465	8,430	21,361
6	501	317	33	4,694	524,408	1,423	3,271	6,117
7	218	70	7	1,943	358,842	1,177	766	3,120
Wk. 4-7 Total	1,396	2,121	95	30,879	8,740,662	5,809	25,069	36,688
Project Total	1,615	3,556	127	44,906	13,876,693	7,320	37,586	52,226

Note: These estimates include test fishery and VGG aboriginal fishery catch and tag recovery data.

[5] The spaghetti tag numbers of all tagged fish observed in the test fishery were recorded and all test fish were released including those with tags. The aboriginal catch (and associated tags) were retained.

The preceding estimates attempt to quantify all populations of fall chum salmon within the Porcupine River upstream of Old Crow. Based on the tag recovery information presented, there potentially were 1,488 tags at large; however, additional tag recoveries were likely recorded in the Old Crow aboriginal fishery catch, which were not combined with the test fishery data. The aboriginal fishery catch that was combined with the mark recapture estimate (2,978) was 57.7% of the total recorded aboriginal catch of 5,179 fall chum salmon.

A total of 326 tags was observed and/or recovered during the operation of the Fishing Branch weir in 2006; this total represents only 21.9% of the tags, which potentially moved upstream of Old Crow. The proportion of tags observed at the weir is much lower than in previous years; this may be the result of high water levels as well as the recovery of additional tags in the Old Crow aboriginal fishery, as mentioned above[6]. Tagged fish were likely not readily detected during turbid water associated with high water conditions and some likely moved through undetected during the protracted period when the weir was breached. The Fishing Branch weir count through October 14, including adjustments to account for days when the weir was not in operation, was 30,849 chum salmon. The 2006 tagging program also encountered operation problems associated with high water for much of the season. The high water limited the locations available to conduct both the mark and recapture activities effectively and resulted in nets that were littered with debris.

7.2.5.3 Stock Identification of Yukon River Chinook and Fall Chum Salmon using Microsatellite DNA Loci

Stock identification of the 2006 Chinook and fall chum salmon migration past the DFO fish wheel program at Bio Island, near the Yukon-Alaska border, was conducted through analysis of microsatellite variation. Variation at 13 microsatellite loci was surveyed for 747 Chinook salmon and variation at 14 microsatellite loci was surveyed for 728 fall chum salmon; samples were collected from the fish wheel program. The seasonal sample[7] for each species was structured in a manner that migrating salmon were sampled in proportion to run abundance on a weekly basis.

For fall chum salmon, 54.9% were estimated to have been from the regional reporting group, which spawns within the White River drainage and 41.0% were from the reporting group, which includes a number of mainstem Yukon River spawning populations (Table 5). The two remaining reporting groups contributing to the run were the Teslin River (3.1%) and the Yukon early group, which is represented by the Chandindu River population (1.0%).

Table 5.–Estimated percentage stock composition of fall chum salmon migrating past the fish wheel tagging program at Bio Island, 2006.

Stat Week	30-34		35		36		37		38		39		40		30-40	
Date	Aug 6-26		Aug 27-Sept 2		Sept 3-9		Sept 10-16		Sept 17-23		Sept 24-30		Oct 1-7		All	
Sample Size	16		25		63		120		267		175		62		728	
Region		SD		SD		SD		SD		SD		SD		SD		SD
Yukon Early	28.1	(10.8)	0.2	(1.7)	0.6	(1.6)	0.1	(0.6)	0.1	(0.3)	0.0	(0.2)	0.1	(0.9)	1.0	(0.5)
Canadian Mainstem	29.1	(11.7)	26.6	(9.3)	35.4	(6.4)	32.2	(4.7)	44.6	(3.4)	44.6	(4.3)	44.5	(7.5)	41.0	(2.0)
White	42.7	(11.7)	72.9	(9.3)	63.9	(6.4)	66.8	(4.6)	50.7	(3.2)	51.0	(4.0)	49.0	(6.6)	54.9	(1.9)
Teslin	0.1	(2.2)	0.2	(1.8)	0.0	(0.6)	0.9	(1.3)	4.5	(1.6)	4.5	(2.2)	6.5	(4.4)	3.1	(0.9)

Note: Stock compositions were estimated using 13 microsatellite loci and the baseline outlined in Table 7. Standard deviations of the estimates are in parentheses.

[6] Additional tag recoveries will be available when the Old Crow catch data is finalized.

[7] Adipose punch samples collected from all Chinook and fall chum salmon caught at the DFO fish wheel tagging program were grouped by statistical week; sub-samples of the weekly samples were then structured and analyzed proportional to the estimated run abundance of each species.

For Chinook salmon, the eight regional reporting groups contributing to the run were Carmacks area tributaries (Big Salmon River, Little Salmon River, Tatchun Creek), (33.0%), Stewart River (13.4%), Teslin River (13.0%), Pelly River (12.4%), North Yukon Mainstem Tributaries (10.3%), Mid-mainstem Tributaries (10.2%), Upper Yukon tributaries (6.0%) and White River (1.7%) (Table 6).

Table 6.–Estimated percentage stock composition of Chinook salmon migrating past the fish wheel tagging program at Bio Island, 2006.

Stat Week	27-28		29		30		31		32-38		27-38	
Date	July 2-15		July 16-22		July 23-29		July 30-Aug 5		Aug 6-12		All	
Sample Size	49		103		215		231		149		747	
Region		SD		SD		SD		SD		SD		SD
North Yukon Tribs.	43.5	(7.2)	25.3	(4.7)	9.9	(2.9)	6.9	(3.3)	1.3	(3.0)	10.3	(1.7)
Mid-mainstem Tribs.	0.4	(1.8)	1.2	(1.7)	4.1	(3.1)	16.7	(4.3)	20.7	(6.8)	10.2	(2.0)
Carmacks Area Tribs.	6.1	(5.1)	1.9	(3.2)	32.4	(4.7)	40.5	(4.7)	52.0	(7.2)	33.0	(2.9)
White River	0.0	(0.4)	1.5	(2.0)	3.3	(1.5)	1.3	(1.0)	0.0	(0.2)	1.7	(0.6)
Stewart River	16.4	(7.5)	19.4	(7.0)	15.6	(4.0)	6.5	(3.8)	9.1	(3.8)	13.4	(2.2)
Pelly River	18.0	(7.3)	24.0	(6.4)	15.6	(3.5)	3.5	(1.7)	7.2	(3.4)	12.4	(1.9)
Upper Yukon Tribs.	0.1	(1.0)	1.0	(1.2)	6.5	(1.9)	12.0	(2.6)	4.3	(2.2)	6.0	(1.0)
Teslin River	15.5	(5.8)	25.7	(6.6)	12.7	(4.2)	12.5	(3.5)	5.4	(3.3)	13.0	(1.9)

Note: Stock compositions were estimated using 14 microsatellite loci and the baseline outlined in Table 8. Standard deviations of the estimates are in parentheses.

The populations and regional reporting groups for fall chum and Chinook salmon are outlined in Tables 7 and 8, respectively.

Table 7.–Baseline used to estimate stock compositions of fall chum salmon from the fish wheel tagging program at Bio Island, 2006.

Region	Populations
Yukon Early	Chandindu River
White River	Kluane River, Donjek River
Mainstem Yukon River	Mainstem Yukon River at Pelly River, Tatchun Creek, Big Creek, Minto
Teslin River	Teslin River

7.2.6 Yukon Education Program 2005–2006

Fisheries and Oceans Canada continued to support the “Salmon in the Classroom” (Stream to Sea) program throughout 2005–2006. The program is available to all Yukon Schools and includes lesson plans and aids, as well as access to the salmon incubation program. The salmon incubation program provides incubation equipment, small numbers of eggs, and technical support to Yukon teachers wishing to complete this component of the program. In 2005–2006, salmon eggs were incubated in 17 aquaria in Yukon schools. In the fall, broodstock were obtained from the Takhini River (Chinook), the Morley River (Chinook), and the Kluane River (Chum) as well as from Tatchun Creek (Chinook). These eggs were raised until the eyed stage in the McIntyre Incubation Facility located in Whitehorse and operated by the Northern Research

Institute. Eggs were then distributed to Yukon schools where they were reared until the fry stage. In the spring, a portion of the fry were released by the schools involved in the program both at the McIntyre facility, where they were later released to their stream of origin by technical staff of both Fisheries and Oceans and the Northern Research Institute. Other schools chose to release fry onsite at Tatchun Creek, and at the Morley, Kluane and Takhini rivers. Stream Keepers North and the Yukon River Panel project CRE-06-67 provided assistance in ensuring that the students were able to travel to the release sites and to participate in the complementary salmon habitat stream lessons.

Table 8.–Baseline used to estimate stock compositions of Chinook salmon from the fish wheel tagging program at Bio Island, 2006.

Region	Populations
North Yukon Tributaries	Chandindu River, Klondike River
White River	Tincup Creek
Stewart River	Mayo River, Stewart Rivers
Pelly River	Big Kalzas, Little Kalzas, Earn, Pelly River, Glenlyon River, Blind Creek
Mid-mainstem Tributaries	Mainstem Yukon River, Nordenskiold River
Carmacks Area Tributaries	Little Salmon River, Big Salmon River, Tatchun Creek
Upper Yukon Tributaries	Wolf Creek, Michie Creek, Whitehorse Hatchery, Takhini River

7.2.7 Chinook Salmon Habitat Investigations

7.2.7.1 Croucher Creek: Juvenile Chinook Salmon/Beaver Interactions

Juvenile Chinook salmon enter and ascend small streams in the upper Yukon River Basin to rear and overwinter. Beaver dams may obstruct access to these habitats. Concerns have been raised regarding the active management of beaver and their structures to maintain or restore access by fish to upstream habitats. To address these concerns, investigations are being conducted by DFO Oceans, Habitat and Enhancement Branch (OHEB) staff.

Investigations commenced in 2004 with a pilot project in the lowest 2 kilometers of Croucher Creek, near Whitehorse. By chance, there was intense beaver activity in lower Croucher Creek that summer. This created an opportunity to document the rapidity with which beaver may modify small streams. A total of 12 cross-channel dams were built in two beaver colonies between early July and late August. About 25% of the length of the creek was back-watered. High densities of young-of-year (0+) juveniles were captured immediately downstream of the larger dams, implying delay or obstruction of the upstream migration.

Beaver activity in 2005 was much lower than in 2004. The first pulse of 0+ Chinook was early compared to other years and was delayed for approximately 2 weeks by the furthest downstream beaver dam. Movement into the area upstream of the dam was then rapid. The out-migration of the 1+ juveniles, that had overwintered in the creek, was monitored. All 1762 juvenile Chinook salmon captured were naturally propagated.

Beaver activity in 2006 was similar to that of 2005. Long-term effects of the beaver became more apparent, particularly valley wall erosion associated with avulsions around the ends of beaver dams. An estimated 266 cubic meters of fine-grained material eroded directly into the creek from a single avulsion. Captures of 1+ Chinook were high, implying excellent over wintering survival. Timing of out migration was somewhat later than other years. Captures of 0+ Chinook salmon downstream of all beaver dams began later than in other years and the rates of capture were initially low. Captures of 0+ Chinook upstream of the dam were considerably delayed, and rates of capture there were low throughout 2006.

Monitoring continues through the winter of 2006–2007.

7.2.7.2 Klondike River Ground Water Channels: Juvenile Chinook Salmon Utilization

Development of ground water channels is a primary method for salmon habitat enhancement/stock restoration in the US Pacific North West and the Canadian Pacific South West. There has been a single project of this type in the Yukon River Canadian sub-basin. An intermittently flowing side channel downstream of the Mayo hydro-electrical dam was deepened to provide additional habitat during low flows. The regulated nature of the river does not reflect natural flow regimes. The findings from the monitoring of this project may not be applicable to areas with non-regulated flows. Additionally, use of natural ground water channels by juvenile Chinook salmon has been little investigated. To address these concerns, investigations were initiated by DFO Oceans, Habitat and Enhancement Branch (OHEB) staff.

A pilot investigation commenced in 2004 on two ground water channels in the Klondike River Watershed near Dawson City. The Germaine Creek Groundwater Channel (GCGC) flows into a seasonally abandoned channel of the Klondike River. The Viceroy Groundwater Channel (VGC) intercepts predominantly hyporheic flows from the North Klondike River and returns them to the river downstream. Sampling in 2005 implied that 0+ juvenile Chinook entered the channels in July. They then moved slowly up the channels during the summer, autumn and into the early winter: as an example, the highest rate of capture in late December was at the head of the channel.

Data loggers were deployed in July 2005 and replaced in 2006. Results will provide insight on the annual and long term thermal regimes of the channels. Results of salmon sampling in 2006 at the GCGC were generally in accord with the 2005 results, but were somewhat muted in comparison. Salmon migration into the VGC, however, was totally obstructed by a beaver dam at the lower end of the channel. No salmon were captured in the VGC in 2006.

Monitoring will continue in 2007.

7.2.7.3 Mickey Creek: Long-term Effects of Forest Fires on Salmon Habitats in Un-glaciated, Permafrost Dominated Landscapes

The effects of forest fires on aquatic habitats in the temperate regions of North America are relatively well known. Little research has been carried out in permafrost dominated landscapes, and essentially none in the heavily dissected non-glaciated areas of the Yukon Plateau in the central Yukon Territory.

During the summer of 2004, most of the watershed of Mickey Creek, a small tributary of the Fortymile River near Dawson City, burned. Short-term effects to lower Mickey Creek included increased stream flows (presumably due to the decrease in evapo-transpiration) and turbidity.

On the advice of DFO Oceans, Habitat and Enhancement Branch (OHEB) staff, the Yukon Geological Survey (YGS) conducted an overview of the area. They were examining options for a detailed watershed based study of the effects of forest fire on land surface stability in permafrost dominated areas. As of mid-July 2005 they had documented more than 70 landslides in the 63 square kilometer watershed that were directly attributable to the 2004 forest fire. Results of the YGS overview may be found in:

http://www.geology.gov.yk.ca/publications/yeg/yeg05/12_lipovsky.pdf

The YGS also examined other options, and chose a watershed more central to the Yukon's placer mining industry for detailed study. The results will be relevant to the management of aquatic environments in permafrost dominated watersheds. However, it will lack the direct connection to Yukon River Chinook salmon rearing and over wintering habitats.

7.3 Restoration and Enhancement Fund

7.3.1 Status of R&E Projects 2006

Project No.	Project	Title Contractor	Funding \$US/Cdn[8]	TC[9]
URE-01N-06	**Yukon River Border Sonar Equipment Purchase**			
		ADF&G	(\$135,700/159,600)	D

Project completed, with no report required, this project involving the purchase of field equipment by the Panel; to be held, used, and maintained by ADF&G. The equipment purchases totaled US\$136,124.23.

URE-05N-06	**Marshal Chinook Test Fishery**			
		AVCP	\$17,800/20,900	D

Approved progress report; final report currently being reviewed.

URE-06-06	**Kaltag Fall Chum/Coho Gillnet Test Fishery**			
		City of Kaltag	\$20,400/24,000	D

Project completed and final report accepted.

URE-08N-06	**Tech. Assistance, Dev., & Support – Fishwheel Video**			
		USF&WS	\$4,500/5,300	D

Project completed and final report accepted.

URE-09-06	**Rampart Rapids All Species Video Monitoring**			
		Stan Zuray	\$34,000/40,000	D

Project completed and final report accepted.

CRE-06N-06	**Salmon Spawning & Rearing Access Restoration**			
		DDRRC[10]	\$5,200/6,000	A

Project completed and final report accepted.

CRE-07-06	**2006 'First Fish' Youth Camp**			
		Tr'ondeck Hwech'in FN	\$3,000/3,500	A

Project successfully completed; final report in progress.

CRE-08N-06	**Salmon Celebration**			
		THFN/YRCFA	\$8,500/10,000	A/P-R

[8] The values noted are those approved by the Panel, while bracketed figures indicate an adjustment to the project budget detail noted in the text.

[9] Technical Contact – Dani Evenson/D (ADF&G), A/Al von Finster, P-R/Pat Milligan, Rick Ferguson, S/Sandy Johnston – DFO, H/Hugh Monaghan – YR Panel Secretariat.

[10] DDRRC – Dawson District Renewable Resources Council

Project completed; final report currently being reviewed.

CRE-10N-06	**Size Selective Fishing – Live Catch Fishwheel**			
		YRCFA/THFN	$29,800/35,000	P-R

Project completed and final report currently being reviewed.

CRE-ll-06	**In-Season Management Fund & Test Fisheries**			
		YRCFA	($40,500/50,000)	P-R

This ‘contingency’ project not required/activated - no report required. Total funding de-committed.

CRE-14-06	***Ichthyophonus* Diagnostics, Education & Outreach**			
		DFO	($6,200/7,300)	S-P

Project completed and final report accepted. Total project payments of $3,320 with $3,980 de-committed.

CRE-19-06	**Mayo Riv Chnl Post Reconstruction – Assess Juv Chin Habitat**			
		NNDFN[11]	$12,900/15,200	A

Project completed and final report accepted.

CRE-20N-06	**Stewart River Chum Pilot**			
		NNDFN	$4,300/5,000	P-R

Project completed with final report pending.

CRE-23N-06	**Prelim Assess Porcupine River Juv Salmon Mig**			
		Vuntut Gwitchin FN	$37,200/43,700	A/P-R

Project completed and final report accepted.

CRE-25N-06	**Project Assistance Mentoring/Capacity Building**			
		Vuntut Gwitchin FN	$10,500/12,400	P-R/A

Project completed and final report accepted.

CRE-26N-06	**Commercial Chum Roe Economic Feasibility**			
		Vuntut Gwitchin FN	$3,800/4,500	P-R/S

Logistical and economic analysis of potential chum roe commercialization completed, awaiting response from DFO on legal/regulatory framework in consultation with Vuntut Gwitchin Government; draft final report in hand, to be completed by the end of March 2007.

CRE-27-06	**Chum Mark/Recap Test Fishery-Porcupine River**			
		Vuntut Gwitchin FN	$57,200/67,300	P-R

Project completed and final report accepted.

CRE-29-06	**Chum Spawning Ground Recoveries-Minto Area**			
		Selkirk RRC[12]	$10,200/12,000	P-R

Project completed and final report accepted.

CRE-31-06	**Pelly River Sub-Basin Community Stewardship**			
		Selkirk RRC	$21,300/25,000	A

Project completed and project report currently being reviewed.

CRE-37-06	**Blind Creek Chinook Salmon Enumeration Weir**			
		Jane Wilson	$37,400/49,200	P-R

[11] First Nation of Nacho Nyak Dun (Mayo area, Yukon - Stewart River System)
[12] Selkirk Renewable Resources Council (Pelly Crossing area - middle mainstem of the Cdn section of the Yukon River, including Pelly River)

Project completed and final report accepted.

CRE-41-06	**Chinook Sonar Enumeration Big Salmon River**			
		Jane Wilson	$65,500/77,000	P-R

Project completed and final report accepted.

CRE-47-06	**Teslin River Sub-basin Community Stewardship**			
		Teslin Tlingit Council	$40,000/47,000	A

Project completed and final report being reviewed.

CRE-48N-06	**Teslin Tlingit People & Salmon Kiosk Interp Centre**			
		Teslin Tlingit Council	$8,500/10,000	A/P-R

Project completed, with final report being drafted.

CRE-50-06	**KDFN Salmon Stewardship**			
		Kwanlin Dun FN	($42,500/50,000)	A/P-R

Project completed and final report accepted. Project came in under budget - approx. $8,000 de-committed.

CRE-53-06	**Range Road dump Stabilization/Clean-Up**			
		Ta'an Kwach'an Council	($19,900/23,400)	A

Project completed and final report accepted. Budget increase of $5,000 approved - total project payout of $28,000.

CRE-54N-06	**Fox Creek Beaver Dam Management**			
		Ta’an Kwach’an Council	$16,200/19,100	A

Project completed and final report accepted.

CRE-55-06	**Upper Nordenskiold Salmon Stewardship**			
		Champagne & Aishihik FNs	$2,000/2,400	A

Project completed. The purpose of this project was to retrieve stream data loggers, which was achieved, with no project report being required. Financial reconciliation with CAFN pending, that cost being as above.

CRE-56N-06	**Upper Takhini/Hutchi Stewardship Plan**			
		Champagne & Aishihik FNs	($12,800/15,000)	A

This project was not activated in consideration of CAFN personnel issues, with this $15,000 being de-committed.

CRE-58-06	**Community Salmon Stewardship**			
		Kluane First Nation	($25,500/30,000)	A

This project not activated in consideration of KFN human resource changes/challenges. This funding has been de-committed, with this project has been re-applied for in 2007.

CRE-61-06	**Chinook Fry Release–Whitehorse Rapids Hatchery**			
		R&D Env Mngmt	$5,100/6,000	A

Project completed and final report accepted.

CRE-63-05	**Whitehorse Rapids Hatchery CWT & Fisheries**			
		YF&GA[13]	($49,500/58,200)	P-R

Project completed and final report accepted. Actual financial commitment of $44,871.20, with $13,328.80 de-committed.

[13] Yukon Fish and Game Association

CRE-64N-06 Wolf Creek Monitoring

YF&GA $5,100/6,000 P-R/A

Project completed and final report accepted.

CRE-65-06 McIntyre Creek Salmon Incubation Project

Yukon College-NRI $36,600/43,100 A

Project proceeding on target with satisfactory progress reports. Final report due March 15, 2007.

CRE-67-06 Yukon Schools Fry Releases & Habitat Studies

Streamkeepers North Soc $3,400/4,000 A

Project approved with late winter/spring 07 workplan. Final report due May 2007.

CRE-75-06 Yukon River Salmon Cooperative

YR Salmon Coop $120,000/141,200 S/R/H

Project proceeding on schedule, with Cdn Section Panel review of 2006 progress and 2007 application scheduled for March 26. Final 2006 project report scheduled for April 30, 2007.

CRE-79-06 Stock ID Microsatellite Variation – Chin & Chum

DFO $34,000/40,000 R-P

Project completed and final project report accepted.

CRE-87-06 Germaine Creek Restoration Monitoring

M. Mils & Assoc. $21,300/25,000 A

Project completed and final report accepted.

CRE-95-06 Yukon Queen II

Yukon River Panel ($8,500/10,000) A/P-R

CRE-95-06 A - Project planning workshop hosted by YQII Project Management Committee with Dawson City Advisory Group, with approved report filed by facilitator - $5,562.

CRE-95-06 B - Field project ($65,400/actual $66,036.) contracted with EDI based on Panel contribution and primary funding provided by Yukon Government and Holland America. Project completed and approved final report received. Net Panel financial commitment as above (i.e., $10,000).

CRE-97-06 Porcupine River Salmon Gathering

Vuntut Gwitchin First Nation $9,600/12,000 A

Project successfully completed and final report accepted.

CRE-98-06 Yukon Stewardship

Yukon Fish & Wildlife Management Board $127,500/150,000 A/S/H

Approved project progress report received. Final report due March 31/07.

CRE-110-06 Canadian Involvement in Eagle Sonar Project

DFO/PacEumetrics ($34,000/40,000) R-P

Project completed, with final report accepted. Actual cost was $30,548.61, de-committing $3,951.39.

8.0 YUKON RIVER SALMON RUN OUTLOOKS 2007

8.1 ALASKA

8.1.1 Chinook Salmon

Yukon River Chinook salmon return primarily as age-5 and age-6 fish, although age-4 and age-7 fish also contribute to the run. The 4-year-old component in 2006 was below average, whereas the 5-year-old component was above average. The previous 2 years (2004 and 2005) runs have been near average indicating good production from the poor runs of 1999 and 2000. Spawning ground escapements in 2000, the brood year producing 6-year-old fish returning in 2006, were well below escapement goals throughout the drainage.

Spawning ground escapements in 2001 were above average throughout the drainage, while 2002 escapements were above average in Canada, but generally below average in Alaska. The BASIS (Bering-Aleutian Salmon International Survey) study has observed significant increases in juvenile Chinook in the Bering Sea. Further, Bering Sea trawl bycatch has observed increases in adult Chinook. Although not all of these fish are bound for Western Alaska, higher bycatch may be an indicator of favorable ocean conditions and Chinook ocean survival may have increased significantly. Assuming an approximately normal return of 5-year-old and 6-year-old fish, the 2007 run is expected to be average to below average and similar to the 2006 run. It is anticipated that the run will provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. Fishery management will be based on inseason assessments of the run. If inseason indicators of run strength suggest sufficient abundance exists to have a commercial fishery, the commercial harvest in Alaska could range from 30,000 to 60,000 Chinook salmon. This range of commercial catch is below the 10-year (1996–2005), not including the low return years of (2000–2001) average of approximately 66,053 Chinook salmon.

8.1.2 Summer Chum Salmon

The strength of the summer chum salmon runs in 2007 will be dependent on production from the 2003 (age-4 fish) and 2002 (age-5-fish) escapements. Though the 2001 run of summer chum salmon was one of the poorest on record and none of the escapement goals were met, the return resulted in the near record run observed in 2006. Summer chum salmon runs have exhibited steady improvements since 2001 with harvestable surpluses in each of the last 5 years (2002–2006). However, it appears that production has shifted from spawning tributaries in the lower portion of the drainage, such as the Andreafsky and Anvik Rivers over the last 5 years, to higher production in spawning tributaries upstream of the Anvik River, such as the Gisasa and Salcha Rivers. Weak returns for chum salmon from 1998 through 2001 were attributed to reduced productivity and not the result of low levels of parent year escapements as 1995 was one of the highest escapements on record. In 2006, a large number of 5-year-old summer chum salmon returns were observed throughout the Arctic-Yukon-Kuskokwim (AYK) Region.

The BASIS (Bering-Aleutian Salmon International Survey) study has observed significant increases in juvenile chum in the Bering Sea. Further, Bering Sea trawl bycatch has observed increases in adult chum. Although not all of these fish are bound for Western Alaska, higher bycatch may be an indicator of favorable ocean conditions and chum ocean survival may have increased significantly.

The 2007 run is anticipated to be near average and provide for escapements and support a normal subsistence and commercial harvest. If inseason indicators of run strength suggest sufficient abundance exists to allow for a commercial fishery, the commercial harvest surplus in Alaska could range from 500,000 to 900,000 summer chum salmon. The actual commercial harvest of summer chum salmon in 2007 will likely be dependent on market conditions for chum salmon and not the amount of surplus available for commercial uses.

8.1.3 Fall Chum Salmon

Yukon River drainage-wide estimated escapements of fall chum salmon for the period 1974 through 2002 have ranged from approximately 180,000 (1982) to 1,500,000 (1975), based upon expansion of escapement assessments for selected stocks to approximate overall abundance (Eggers 2001). Escapements in these years resulted in subsequent returns that ranged in size from approximately 312,000 (1996 production) to 2,900,000 (2001 production) fish, using the same approach to approximating overall escapement. Corresponding return per spawner rates range from 0.3 to 3.2, averaging 1.8 for all years combined (1974–2000).

A considerable amount of uncertainty has been associated with these run projections particularly recently because of unexpected run failures (1997 to 2002) which were followed by a strong improvement in productivity from 2003 through 2006. Weakness in salmon runs prior to 2003 has generally been attributed to reduced productivity in the marine environment and not a result of low levels of parental escapement. Likewise, the recent improvements in productivity may be attributed to the marine environment. Projections have been presented as ranges since 1999 to allow for adjustments based on more recent trends in production. Historical ranges included the normal point projection as the upper end and the lower end was determined by reducing the projection by the average ratio of observed to predicted returns from 1998 to each consecutive current year through 2004 (Table 9). In 2005, the average ratio of the years 2001 to 2004 was used, in attempts to capture some of the observed improvement in the run. Methods used to provide a range around the point estimate in 2006 and 2007 are described below.

Yukon River fall chum salmon return primarily as age-4 and age-5 fish, although age-3 and age-6 fish also contribute to the run (Appendix Table A16). The 2007 run will be comprised of parent years 2001 to 2004 (Table 10). Estimates of return per spawner based on brood year return were used to estimate production for 2001 and 2002 and an auto-regressive Ricker spawner-recruit model was used to predict returns from 2003 and 2004. The point estimate utilizes 1974 to 1983 even/odd maturity schedules to represent years of higher production. The 2007 projected point estimate is 1.0 million fall chum salmon with the following approximate age composition given in Table 10.

The forecast range is based on the upper and lower values of the 80% confidence bounds for the point projection. Confidence bounds were calculated using deviation of point estimates and observed returns from 1987 through 2006. Therefore, the 2007 run size projection is expressed as a range from 900,000 to 1.2 million fall chum salmon.

Escapements for the 2001 and 2002 parent years, that will contribute age-6 and age-5 fish respectively in the 2007 run, were below the midpoint of the drainage wide escapement goal of 300,000 to 600,000 fall chum salmon. The 2003 escapements were above the upper end of the drainage-wide escapement goal range. The major contributor to the 2007 fall chum salmon run is anticipated to be age-4 fish returning from the 2003 parent year. Based on a combination of high production and a fair showing of age-3 fish returning last season there is optimism for an above average return of age-4 fish in the 2007 run. Age-3 fish are typically a small portion of the return but a projection of 6% is higher than average for an odd-numbered year (Appendix Table A16).

Table 9.–Preseason drainage-wide fall chum salmon outlooks and observed run sizes for the Yukon River, 1998–2006.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	880,000	334,000	0.38
1999	1,197,000	420,000	0.35
2000	1,137,000	239,000	0.21
2001	962,000	382,000	0.40
2002	646,000	425,000	0.66
2003	647,000	775,000	1.20
2004	672,000	614,000	0.91
2005	776,000	2,163,000	2.79
2006	1,211,000	1,141,000	0.94
Average	(1998 to 2006)		0.87

Table 10.–Projected return of fall chum salmon based on parent year escapement for each brood year and predicted return per spawner (R/S) rates, Yukon River, 2001–2004.

Brood Year	Escapement	Estimated production (R/S)	Estimated Production	Contribution based on age	Current Return
2001	337,765	8.46	2,857,492	0.8%	8,987
2002	397,977	1.34	533,289	11.1%	119,364
2003	695,363	1.64	1,140,395	82.1%	881,908
2004	537,873	1.72	925,142	5.9%	63,881
Total expected run (unadjusted)					1,074,139
Total expressed as a range based on the forecasted vs. observed returns from 1987 to 2006 (80% CI):					900,000 to 1.2 million

The 2001 brood year produced exceptionally well with a return of nearly 3 million fish including record contributions in nearly all age classes. Return of age-4 fish from odd-numbered brood years during the time period 1974 to 2000 typically average 720,000 chum salmon, and ranges from a low of 175,000 for brood year 1988 to a high of 2 million for brood year 2001. Based on the high production years from 1974 to 1983, the return of odd-numbered brood years averages 979,000 chum salmon. Return of age-5 fish from odd-numbered brood years during the time period 1974 to 2000 typically averages 212,000 chum salmon, and ranges from a low of 57,000 for brood year 1998 to a high of 674,000 for brood year 2001. The estimated 2002 brood year return appears to be near average for an even-numbered year and the 2003 brood year contributed a slightly less than average return of age-3 fish in 2006.

If the 2007 run size is near the projected range of 900,000 to 1.2 million, it will be well above the upper end of the BEG range of 600,000 fall chum salmon. A run of this projected size should support normal subsistence fishing activities and should provide opportunity for commercial ventures where markets exist. The strength of the run will be monitored in season to determine appropriate management actions and levels of harvest based on stipulations in the Alaska *Yukon River Drainage Fall Chum Salmon Management Plan*.

8.1.4 Coho Salmon

Although there is little comprehensive escapement information on Yukon River drainage coho salmon, it is known coho salmon primarily return as age-4 fish and overlap in run timing with fall chum salmon. The major contributor to the 2007 coho salmon run will be the age-4 fish returning from the 2003 parent year. Based on Pilot Station sonar operations from 1995, and 1997 through 2006, the 2003 passage estimate of 269,000 coho salmon was the highest on record. The Delta Clearwater River (DCR) is the major producer of coho salmon in the upper Tanana River drainage, and the parent year escapement of 102,000 fish was six times the upper end of the SEG range of 5,200 to 17,000 coho salmon. Although 2003 was the peak escapement count, DCR abundance has been on the increase since 1972, in particular within the last decade. Evaluations of coho salmon escapements in the Andreafsky, Nenana, and Richardson Clearwater rivers also indicated the run was average to above average. Assuming average survival, the 2007 coho salmon run, is anticipated to be average to above average based on good escapements in 2003.

The Alaska Yukon River Coho Salmon Management Plan allows a directed commercial coho salmon fishery, but only under unique conditions. Directed coho salmon fishing is dependent on the assessed levels in the return of both coho and fall chum salmon since they migrate together.

8.2 CANADA

8.2.1 Canadian-Origin Upper Yukon Chinook Salmon

The total run size of the Canadian-origin Upper Yukon River Chinook salmon in 2007 is expected to be approximately 93,700 fish, which constitutes an average run. This outlook is based on the average of a stock/recruitment (S/R) outlook and a sibling outlook. The outlook derived from the S/R model developed from the 1982 to 2000 brood years is 74,500 fish, while the outlook from the sibling relationship is 112,900 fish.

Three of the four primary brood year escapements that will contribute to the 2007 run exceeded the interim rebuilding goal of 28,000 Chinook salmon (Appendix Table A17) and achieved or exceeded the escapement goal range of 33,000 to 43,000 Chinook salmon for rebuild stocks. These included estimated escapements of 42,438 Chinook salmon in 2001; 40,145 in 2002; and 47,486 in 2003. The weighted average (by age) brood escapement that will contribute to the 2007 Upper Yukon Chinook salmon run derived from the 2000 to 2003 brood years is 39,400 fish[14].

The 2007 run outlook, estimated using the S/R model, involved calculating the total expected return from each brood year escapement and then apportioning the returns by a 10-year average age composition. The estimated production from each brood year was then summed to produce the estimated run size of 74,500 for 2007. The S/R relationship projects very high return per spawner values for low escapement years and much lower returns per spawner for high escapement years. The estimated return/spawner for each of the principal brood years is as

[14] The brood year escapements from 2000-2003 represent 99.8% of the brood year escapement used to determine the base level escapement. The 2000 spawning escapement (11,344), which will contribute to the age-7 age component of the 2007 run, was lower than the lower lend of the target range. However, for a rebuilt run, base level escapement calculations using different brood year escapements expanded for other age classes exceed the lower end of the target range for rebuilt stocks. For example, the base level escapement derived using the age-4 to age-7 components, age-5 to age 7 components, and age-5 and age-6 components is 39,400, 39,100, and 41,700, respectively.

follows: 8.7 for 2000; 1.7 for 2001; 1.9 for 2002; and 1.3 for 2003. Over the 1995–2006 period, the average age composition of brood year returns is as follows: 0.02% age-3, 3.1% age-4, 27.5% age-5, 61.1% age-6, 8.4% age-7, and 0.01% age-8.

The 2007 run outlook that was based on a sibling methodology involved preliminary analyses of the return in 1 year and the return from the same brood year the next year to determine which relationships were significant. The data used in the analyses involved the 1979 to 2000 brood year returns. The relationship between the return of 5-year old fish and the estimated return the following year of 6-year old fish was highly significant. The return of 4-year-old fish and the estimated return the following year of 5-year old fish were significant. Usually 5-year old and 6-year old Chinook salmon account for ~90% of total Canadian run. The 2007 sibling outlook involved a combined estimated return of ~101,600 age-5 and 6-year old Chinook salmon, which was then expanded to ~112,900 to account for the other age classes.

As in previous years, the outlook relies largely on spawning escapement estimates derived from mark–recapture data. Information from the Eagle sonar program in 2005 and 2006 suggests that this data may be biased low. However, additional years of overlap between sonar and mark–recapture are required before conclusions can be drawn about the consistency, magnitude and overall nature of the potential bias. The S/R and sibling relationships do not capture the uncertainty associated with rapid changes in marine and/or freshwater survival. An additional consideration for spawner-recruitment relationships is that they are usually developed from density-dependent relationships developed for a single stock rather than the aggregate of a number of stocks as is used for Yukon River Chinook salmon outlooks. The performance of run outlooks, developed from S/R models for the 1998 to 2006 period, are shown in Table 11.

A review of the past performance of preseason outlooks is an attempt to take into account a recent decline in the Upper Yukon Chinook salmon return per spawner values. Despite good brood year escapements, the observed run sizes within the 1998 to 2001 period were relatively low. Available information suggests that the low returns observed resulted from poor marine survival.

Table 11.–Preseason Upper Yukon Chinook salmon outlooks and observed run sizes for the 1998–2006 period.

Year	Expected Run Size (Preseason)	Observed Run Size (Post season)	Proportion of Expected Run
1998	143,000	69,500	0.49
1999	84,700	83,800	0.99
2000	128,000	36,100	0.28
2001	124,000	77,500	0.63
2002	95,000	110,700	1.17
2003	90,300	117,600	1.30
2004	107,200	109,100	1.02
2005	107,000	86,900	0.81
2006	93,000	89,400	0.96
Average (1998 to 2006)			0.85

8.2.2 Canadian-Origin Upper Yukon Fall Chum Salmon

The outlook for the 2007 Upper Yukon fall chum salmon run is a below average to average run of 94,600 to 147,600 fish. For odd-years returns, on average, 69% of Upper Yukon adult fall chum salmon return as age-4 and 29% return as age-5. These percentages suggest the major portion of the 2007 fall chum salmon run will originate from the 2002 and 2003 brood years. The estimated escapements for these years were 98,695 and 142,683, respectively; both years exceeded the escapement goal for rebuilt Upper Yukon fall chum salmon of >80,000 fish (Appendix Table A17). The weighted average (by age) brood escapement that will contribute to the 2007 Upper Yukon fall chum salmon run is 127,700 fish.

Prior to 2002, preseason outlooks for Upper Yukon fall chum salmon were based on an assumed productivity of 2.5 returning adults per spawner (R/S); this was the same productivity used in the joint Canada/US Upper Yukon fall chum salmon rebuilding model. This return rate is similar to the 1982–2000 average of 2.4, but is lower than the 1982–2001 average rate of 3.2 R/S; the rate increases when 2001 data is included due to the exceptional fall chum salmon run of 2005. There was very low survival for the 1994 to 1998 brood years; the R/S values calculated for 4 of the 5 years within this period was equal to, or below, the replacement value, i.e., R/S=1.0; the estimated R/S for brood years 1994 to 1998 were 0.8, 0.7, 0.3, 1.0 and 1.6, respectively. The R/S for the brood years within the 1999–2001 period were 4.0, 2.4 and 19.3, respectively; the R/S value for brood year 2001 was an unprecedented high.

Since 2002, preseason outlooks have been based on stock/recruitment models, which incorporate escapement and subsequent associated adult return by age data. Annual runs were reconstructed using mark–recapture data and assumed contributions to US catches. Although insufficient stock identification data was available for accurately estimating the annual US catch of Upper Yukon fall chum salmon, estimates have usually[15] been made with the following assumptions:

1) Thirty percent of the total US catch of fall chum salmon is composed of Canadian-origin fish;

2) The US catch of Canadian-origin Upper Yukon and Canadian-origin Porcupine River fall chum salmon is proportional to the ratio of their respective border escapements; and

3) The Porcupine River border escapement consists of the Old Crow aboriginal fishery catch plus the Fishing Branch River weir count.

All of these assumptions require additional evaluation as some recent Porcupine River mark–recapture data are available and advances in genetic stock ID (DNA) should permit more accurate estimates of the proportion of Canadian fall chum salmon run, which is harvested in US fisheries.

The 2007 Upper Yukon fall chum salmon outlook was developed by estimating the total production for the 2001–2004 brood years. These brood years will produce the 3 to 6 year old fish returning in 2007. Each brood year has a calculated R/S rate, which is dependent upon the escapement level. The expected production in 2007 was further estimated by assuming each brood year would produce an average age composition for odd year returns, i.e., 1.2% age-3, 68.9% age-4, 28.7% age-5, and 1.2% age-6. For example, the estimated R/S for the brood

[15] Recent tagging information has been incorporated into the Porcupine run reconstruction and there has been some minor deviation from the assumption that 30% of the total US catch of fall chum salmon is composed of Canadian-origin fish.

escapement of 98,695 in 2002 is 1.26. The total production from the 2002 escapement is therefore expected to be ~124,300 fish. If 28.7% of this production returns at age-5, it is expected that ~35,700 fish from the 2002 escapement will contribute to the 2007 run. Summing the estimated production from the 2001 to 2004 brood year escapements produces a total expected run size of 94,600 in 2007. This outlook is lower than expected given the magnitude of the brood year escapements and the trend observed over the 2003–2006 period, during which the estimated run sizes consistently exceeded preseason outlooks. An upper outlook of 147,600 was therefore developed by expanding the 94,600 outlook by 1.56, the average preseason outlook / postseason estimate for the 2003–2006 period (excluding 2005). The outlook range is therefore a below average to average run of 94,600 to 147.600. A summary of preseason outlooks, postseason run size estimates and proportion of the expected run size observed for the 1998 to 2006 period is presented in Table 12.

The 1998 to 2002 Canadian-origin Upper Yukon fall chum runs consistently failed to meet the preseason outlooks and it appears that the assumed adult production of 2.5 R/S was too high for these years. However, the estimated run sizes have shown improvement since 2003 and exceptional survival of the 2001 brood year appears to have bolstered both the 2005 and 2006 returns.

Table 12.–Preseason Upper Yukon fall chum salmon outlooks and observed run sizes for the 1998–2006 period.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	198,000	61,400	0.31
1999	336,000	98,400	0.29
2000	334,000	62,900	0.19
2001	245,000	45,100	0.18
2002	144,000	109,900	0.76
2003	145,000	179,800	1.18
2004	146,500	181,300	1.24
2005	126,000	515,200	4.09
2006	126,000	284,200	2.26
Average	(1998 to 2006)		1.17

8.2.3 Canadian-Origin Porcupine River Fall Chum Salmon

Serious conservation concerns for the Fishing Branch River fall chum salmon arose in the late 1990's and were heightened in 2000 when the count through the Fishing Branch weir was only 5,053 fish, the lowest on record. However, some improvements have been observed since that time with counts ranging from 13,563 in 2002 to 121,413 in 2005.

The 2007 fall chum salmon run to Canadian portions of the Porcupine River drainage should originate primarily from the 2002 and 2003 escapements. The Fishing Branch River weir counts for these years were 13,563 and 29,519 fall chum salmon, respectively. These counts were 49.6% and 86.3% of the 1996–2005 average of 34,220 fish. The 2002 and 2003 counts both fell below the lower end of the Fishing Branch River escapement goal range for a rebuilt stock of 50,000 to 120,000 (Appendix Table A17) fall chum salmon. The weighted average (by age) base year escapement for the 2007 Fishing Branch River fall chum run is 25,500[16].

Assuming a return/spawner value of 2.5, and using the average 10-year (odd year) age at maturity for Fishing Branch fall chum salmon of 72.8.% age-4 and 24.9% age-5 fish, as indicated in the Table 13, an above average return of 63,600 fall chum salmon is expected in 2007 (Table 13).

Table 13.–Outlook for the 2007 Fishing Branch River fall chum salmon run developed using brood year escapement data, a return/spawner value of 2.5 and an average age composition.

Brood Year	Escapement	Estimated Production @ 2.5 (R/S)	Contribution based on age	Expected 2007 Run
2002	13,563	33,908	24.9%	8,443
2003	29,519	73,798	72.8%	53,725
Sub-total				62,168
Total expected run (expanded for other age classes and rounded)				63,600

The 2007 outlook is the estimated number of fish entering the mouth of the Yukon River and this number will be decreased by US and Canadian fisheries prior to the fish being counted at the Fishing Branch weir. It has been difficult to accurately estimate the US harvest rate (and catch) of Porcupine stocks, although DNA analyses may improve this situation in the near future. Nevertheless, the 2007 Fishing Branch River fall chum salmon run may be sufficiently strong to exceed the 1996–2005 average weir escapement of 34,220 chum salmon. As was observed with the Upper Yukon fall chum salmon stocks, the postseason estimates of the estimated Porcupine fall chum salmon run sizes were consistently below preseason outlooks throughout the 1998 to 2002 period; however, the postseason estimates have been close to, or higher than, preseason outlooks since 2003, with the exception of 2006, as is presented in Table 14.

8.2.4 Spawning Escapement Target Options in 2007: Canadian Origin Chinook and Fall Chum Salmon

8.2.4.1 Upper Yukon Chinook Salmon

The current escapement goal range for rebuilt Canadian-origin Yukon River Chinook salmon, excluding Porcupine River drainage stocks, is 33,000 to 43,000 fish. In recognition that Chinook salmon escapements were depressed, the Yukon River Panel developed an interim rebuilding goal of >28,000 for 1996 through 2002, which both Parties (US and Canada) endeavored to manage for. In 2003, the escapement target was 25,000 Chinook, but was to be increased to 28,000 in the event a U.S. commercial fishery was initiated. In 2004, the escapement target for Canadian-origin Upper Yukon Chinook salmon was >28,000 Chinook salmon. If the run was

[16] The base level escapements from 2002 and 2003 represented 24.9% and 72.8% of the weighted average, respectively for odd year returns; the base level escapement derived from these years was then adjusted for the small proportion of age classes from other years.

gauged to be sufficiently strong, the escapement target could range up to 38,000 Chinook salmon, although the Panel did not describe what constituted a “strong” run. In 2005 and 2006, the escapement target for Canadian-origin Upper Yukon Chinook salmon remained unchanged, >28,000 Chinook salmon.

Table 14.–Preseason Porcupine River fall chum salmon outlooks and observed run sizes for the 1998–2006 period.

Year	Expected Run Size (Preseason)	Estimated Run Size (Post season)	Proportion of Expected Run
1998	112,000	24,700	0.22
1999	124,000	23,600	0.19
2000	150,000	12,600	0.08
2001	101,000	32,800	0.32
2002	41,000	19,300	0.47
2003	29,000	46,100	1.59
2004	22,000	31,700	1.44
2005	48,000	189,700	3.95
2006	53,500	48,200	0.90
Average - 1998 to 2006			1.02

Since 2004, the Yukon Panel has continued to recommend an annual escapement target of >28,000 Upper Yukon Chinook salmon as the brood year escapements contributing to the 2003–2006 runs were below the escapement goal range for rebuilt stocks. During discussions in the March 2006 meeting, the Panel agreed to consider adopting a higher spawning escapement target for 2007. The brood year spawning escapements, which will contribute to the age-4, age-5 and age-6 components of the 2007 run all achieved, or exceeded, the target range for a rebuilt stock, i.e., 33,000–43,000 Chinook. The 2000 spawning escapement (11,344), which will contribute to the age-7 age component of the 2007 run, was lower than the lower end of the target range for a rebuilt stock of 33,000. However the base level Chinook salmon escapement (weighted average for 2000–2003 escapements) for the 2007 run is 39,400 fish.

In previous years, the JTC presented a number of options for spawning escapement targets to rebuild the stock according to rebuilding scenarios as specified in the Agreement, i.e., one to three cycle rebuilds. Rebuilding options are not necessary for 2007 as the Panel has agreed to consider adopting a higher spawning escapement target for 2007 and the base level Chinook salmon escapement (weighted average for 2000–2003 escapements) for the 2007 run falls within the escapement goal range for rebuilt stocks.

Given the 2007 run outlook for a total run size of 93,700 Canadian-origin Chinook salmon, Table 15 summarizes the expected total allowable catch (TAC), harvest shares, border escapement targets and maximum allowable US harvest rates at different escapement targets, i.e., the lower, midpoint and upper part of the escapement goal range of 33,000 to 43,000 fish.

Table 15.–Expected 2007 Canadian-origin Upper Yukon Chinook salmon run size with potential US and Canadian and harvests based on different escapement targets.

Expected Run Size	Escapement Target	TAC	CDN Share (23%)	US Share (CDN stock)	Estimated Total US Harvest	Border Passage Target	Allowable US Harvest Rate
93,700	33,000	60,700	14,000	46,700	93,400	47,000	50%
93,700	38,000	55,700	12,800	42,900	85,800	50,800	46%
93,700	43,000	50,700	11,600	39,100	78,200	54,600	42%

8.2.4.2 Upper Yukon Fall Chum Salmon

Similar to Canadian-origin Chinook salmon, the 2007 run of Upper Yukon fall chum salmon is considered to be a rebuilt run as the primary brood year spawning escapements achieved the level for a rebuilt stock as defined by the Agreement, i.e., >80,000 fish. The recommended target for 2007 is therefore a spawning escapement of >80,000 fish. It is noted that the base level for the Upper Yukon Canadian-origin fall chum salmon escapement (weighted average of 2002 and 2003 escapements[17]) for 2007 is 127,700 chum salmon.

The 2007 outlook for the Canadian-origin fall chum salmon has been developed as a range from 94,600 to 147,600 fall chum salmon. The expected total allowable catch (TAC), harvest shares, border escapement targets and maximum allowable US harvest rates were evaluated and results are summarized in Table 16.

Table 16.–Expected 2007 Canadian-origin Upper Yukon fall chum salmon run size and potential Canadian and US and harvests based on an escapement target of 80,000.

Lower and Upper Expected Run Size	Esc. Target	TAC	CDN Share (32%)	US Share (CDN stock)	Estimated Total US Harvest	Border Passage Target	Allowable US Harvest Rate
94,600	>80,000	14,600	4,700	9,900	39,600	84,700	10%
147,600	>80,000	67,600	21,600	46,000	184,000	101,600	31%

Total US harvest estimates in Table 16 are based on an assumed stock composition of 25% Upper Yukon chum salmon. Market conditions are expected to be reduced again in 2007 and hence commercial exploitation will likely be relatively light.

It is likely that the 2007 run size will be close to the upper end of the preseason outlook. Catches will likely meet U.S. subsistence and Canadian First Nation needs and there should be Canadian commercial fishing opportunities.

8.2.4.3 Fishing Branch River Fall Chum Salmon

The 2007 run of Fishing Branch River fall chum salmon is expected to be 63,600 fish. The base level escapement for the 2007 run is 25,500 chum salmon. The targets to rebuild this base level

[17] These years are estimated to comprise 97.6% of the base level escapement; the weighted average derived from these years was then adjusted for the other year classes.

escapement to the lower end of the Fishing Branch escapement goal range of 50,000 to 120,000 fish over one, two, and three cycles are summarized in Table 17.

Table 17.–Base level escapement to the Fishing Branch weir with the 2007 escapement targets for one, two and three cycle rebuilding options.

Basel Level Escapement = 25,500	
Rebuilding Option	2007 Escapement Target
1 cycle	50,000
2 cycle	38,000
3 cycle	34,000

To assess the potential impact of different escapement target options, a similar approach to that done for Upper Yukon Chinook and fall chum salmon was followed (Table 18).

Table 18.–Expected 2007 Fishing Branch River fall chum salmon run size with the total allowable catch based on one, two and three cycle escapement targets.

Expected Run Size	Escapement Target	Total Allowable Catch
63,600	1-cycle 50,000	13,600
63,600	2-cycle 38,000	25,600
63,600	3-cycle 34,000	29,600

With a one-cycle rebuilding program, the target escapement of 50,000 fish would allow for a TAC of 13,600 fish. The implied overall harvest rate under this scenario is 21%. Under a two-cycle rebuilding program, the target escapement of 38,000 would leave 25,600 fish available for harvest drainage wide with an overall harvest rate of about 40%. Under the three-cycle rebuilding program, the target escapement of 34,000 would allow a drainage wide harvest of 29,600 fish and an overall harvest rate of approximately 46%. If the Vuntut Gwitchin Government wishes to harvest its needs of 6,000 fish near the community of Old Crow, the available US harvest under the one, two and three cycle rebuild options are 7,600, 19,600, and 23,600, respectively. The potential US harvest rates for the one, two and three cycle rebuild options are 12%, 31% and 37%, respectively.

9.0 STATUS OF ESCAPEMENT GOALS

ADF&G undertakes a triennial review of salmon escapement goals in preparation for its triennial Board of Fisheries (board) meeting. This review is governed by the state’s Policy for the Management of Sustainable Salmon Fisheries (5AAC 39.222) and Policy for Statewide Salmon Escapement Goals (5AAC 39.223) adopted in 2001. Under these policies the department sets either a biological escapement goal (BEG) or a sustainable escapement goal (SEG) (ADF&G 2004; Brannian et al. 2006). Biological escapement goal (BEG) refers to a level of escapement that provides the highest potential to produce maximum sustainable yield. Sustainable escapement goal (SEG) identifies a level of escapement known to provide for sustainable yield over a 5 to 10 year period.

Most AYK Region escapement goals were set in the late 1970s or early 1980s. These goals were first documented by Buklis (1993) as required under the department's original escapement goal policy signed in 1992. The next changes to these goals were adopted in 2001 when BEGs were set for Yukon fall chum salmon (Eggers 2001), Anvik River summer chum salmon (Clark and Sandone 2001), and Andreafsky River summer chum salmon (Clark 2001). These 2001 goals were adopted prior to passage of the policies, but were consistent with the policies.

Beginning in December of 2002, ADF&G undertook the first full review of its escapement goals following the adoption of the policies. An escapement goal review team, consisting of staff from Sport Fish and Commercial Fisheries Divisions, met five times over a 14-month period. Federal agency biologists and representatives of Tribal and fishing groups were invited to attend and participate in the meetings. The team's recommendations were presented to the Alaska Board of Fisheries in January 2004 and formally adopted by the department in 2005. During this review, analyses for escapement goals established in 2001 were updated with the latest information and most goals were brought into compliance with the policies by making them ranges, rather than point goals.

In preparation for the January 2007 Board of Fisheries meeting, the department again reviewed escapement goals. Formal meetings, open to agencies and the public, were held in April and November of 2005. Draft analyses were widely distributed for review and comment starting in January 2006 and a public review draft of recommendations for changes was distributed in March 2006. A final document summarizing the escapement goal review was submitted to the Board of Fisheries on April 10, 2006. No changes were recommended for Yukon River escapement goals in 2007.

9.1 CHINOOK SALMON

Five Chinook salmon aerial survey goals were converted to ranges and formally adopted in 2005 using the method devised by Bue and Hasbrouck (*Unpublished*). In the case of Nulato River, the goals for the two forks were combined into a single goal (Table 19). The escapement goal team recommended no changes to these escapement goals for 2007 and anticipates none will be adopted by the Board of Fisheries.

Table 19.–Yukon River escapement goals set for Chinook salmon in 2005 were continued in 2006 and will be in effect for 2007.

Chinook Salmon Stock	Previous Goal (Type) Year Established	Goal Adopted in 2005 (Type)	Goal Adopted in 2007
E. Fork Andreafsky River	>1,500 (EO[a]) 1992	960–1,700 (SEG)	No Change
W. Fork Andreafsky River	>1,400 (EO[a]) 1992	640–1,600 (SEG)	No Change
Anvik River	>1,300 (EO[a]) 1992	1,100–1,700 (SEG)	No Change
Gisasa River	>600 (EO[a]) 1992	420–1,100 (SEG)	No Change
Nulato N. and S. combined	None	940–1,900 (SEG)	No Change
Chena River	2,800–5,700 (BEG) 2001	No Change	No Change
Salcha River	3,300–6,500 (BEG) 2001	No Change	No Change

[a] Goals were called escapement objectives (EO) because they were inconsistent with definitions BEG and SEG within the policy.

9.1.1 JTC Discussion of BEG for Upper Yukon Chinook Salmon

A comprehensive Biological Escapement Goal for Canadian origin Upper Yukon River Chinook salmon cannot be developed using available data and the Chinook Technical Committee criteria. At this time, the data are insufficient to warrant a Pacific Scientific Advice Review Committee (PSARC) review. The JTC will continue to reconcile minor differences in harvest and escapement estimates and investigate other methods to develop a less comprehensive BEG or a Spawning Escapement Goal. Available information on the return per spawner information for Yukon River Chinook salmon is presented in Appendix Table A8 and Figure 5.

9.2 SUMMER CHUM SALMON

In 2005, aerial survey goals for summer chum salmon were discontinued for the East and West Forks of the Andreafsky River in favor of using the East Fork Andreafsky River weir escapement goal as an index of escapement into the system. No change was recommended for the East Fork Andreafsky River weir goal. The biological escapement goal for Anvik River summer chum salmon was revised from the 400,000 to 800,000 fish to a range of 350,000 to 700,000 as measured by the Anvik River sonar (Table 20). The escapement goal team recommended no changes to these escapement goals for 2007 and anticipates none will be adopted by the Board of Fisheries.

Table 20.–Yukon River escapement goals set for summer chum salmon in 2005 were continued in 2006 and will be in effect for 2007.

Summer Chum Salmon Stock	Previous Goal and Year Established	Goal Adopted in 2005 (Type)	Goal Adopted in 2007 (Type)
E. Fork Andreafsky R.	65,000–130,000 (BEG) 2001	No Change (weir)	No Change (weir)
E. Fork Andreafsky R.	35,000–70,000 (BEG) 2001	Discontinued (aerial)[a]	No Change (aerial)[a]
W. Fork Andreafsky R.	65,000–130,000 (BEG) 2001	Discontinued (aerial)[a]	No Change (aerial)[a]
W. Fork Andreafsky R.	35,000–70,000 (BEG) 2001	Discontinued (aerial)[a]	No Change (aerial)[a]
Anvik R.	400,000–800,000 (BEG) 2001	350,000–700,000 (sonar)	No Change (sonar)

[a] Discontinued because of difficulty conducting aerial surveys of summer chum salmon.

9.3 FALL CHUM SALMON

Analyses for all biological escapement goals for Alaskan fall chum salmon stocks were updated in 2005 using the most recent data and no change was recommended for any of the goals (Table 21). The escapement goal team recommended no changes to these escapement goals for 2007 and anticipates none will be adopted by the Board of Fisheries. There are no fall chum salmon BEGs for Canadian origin stocks to the upper Yukon River mainstem and Porcupine Rivers. Goals developed by ADF&G in 2001 were not accepted by PSARC in 2002 because of concerns for data quality.

Table 21.–Yukon River escapement goals set for fall chum salmon in 2005 were continued in 2006 and will be in effect for 2007.

Fall Chum Salmon Stock	Previous Goal (Type) Year Established	Goal Adopted in 2005	Goal Adopted in 2007
Yukon Drainage	300,000–600,000 (BEG) 2001	No Change	No Change
Tanana River	61,000–136,000 (BEG) 2001	No Change	No Change
Delta River	6,000–13,000 (BEG) 2001	No Change	No Change
Toklat River	15,000–33,000 (BEG) 2001	No Change	No Change
Upper Yukon tributaries	152,000–312,000 (BEG) 2001	No Change	No Change
Chandalar River	74,000–152,000 (BEG) 2001	No Change	No Change
Sheenjek River	50,000–104,000 (BEG) 2001	No Change	No Change

9.4 COHO SALMON

For coho salmon in 2005, the Delta Clearwater River boat survey goal was revised from >9,000 to a sustainable escapement goal range of 5,200–17,000 using the Bue and Hasbrouck (*Unpublished*) method. The escapement goal team recommended no change to this escapement goal for 2007 and anticipates none will be adopted by the Board of Fisheries.

10.0 MARINE FISHERIES INFORMATION

10.1 INTRODUCTION

Yukon River salmon migrate as juveniles out of the river and into the Bering Sea. Where they go once they enter the ocean is only partly understood, but evidence from tagging studies and the analysis of scale patterns indicate that these salmon spread throughout the Bering Sea, some move considerably south of the Aleutian Island chain into the Gulf of Alaska and North Pacific Ocean, and some move north into the Chukchi Sea. While in the ocean, they mix with salmon stocks from Asia and elsewhere in North America.

While in the ocean, some of these salmon are caught by commercial fisheries that take place in marine waters. Marine commercial fisheries with a bycatch that likely included some Yukon River salmon included: (1) the U.S. groundfish trawl fisheries in the Bering Sea-Aleutian Islands management area (BSAI) and in the Gulf of Alaska, and (2) the purse seine and gill net salmon fishery in the South Alaska Peninsula ("False Pass") area. Other commercial fisheries, which operate in marine waters of the Bering Sea and Gulf of Alaska where Yukon River salmon occur, but which catch few, if any, salmon include: (1) the U.S. longline fisheries for Pacific halibut, Pacific cod, and other groundfish, (2) the U.S. pot fisheries for Pacific cod and other groundfish, and Dungeness, king, and Tanner crab, and (3) the U.S. purse seine and gillnet fisheries for Pacific herring.

Until 1992, five large commercial fisheries in the ocean caught large numbers of salmon, some of which were likely Yukon River salmon. However, under international agreements, those fisheries no longer operate. They were (in order of decreasing salmon catches): (1) the Japanese high-seas mothership and land-based salmon gill net fisheries; (2) the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan, the Republic of Korea, and the Republic of China

(Taiwan); (3) the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska, (4) the joint venture groundfish fisheries of the Bering Sea and the Gulf of Alaska, and (5) the groundfish trawl fishery by many nations in the international waters area of the Bering Sea ("the Doughnut Hole").

The South Unimak and Shumagin Islands June fisheries occur along the south side of the Alaska Peninsula and from 1975 through 2000 they were managed based on forecasted Bristol Bay sockeye salmon inshore harvests. These fisheries also harvest chum salmon, which are destined for a wide range of locations. Consequently, the Alaska Board of Fisheries (BOF) placed a chum salmon harvest cap on both South Alaska Peninsula June fisheries to protect Artic-Yukon-Kuskokwim (AYK) Area chum salmon stocks in 1986 and from 1986 through 2000. In 2001, the BOF designated several AYK chum stocks plus the Kvichak River sockeye salmon as stocks of concern. From 2001 to 2003, the South Peninsula June fisheries were limited to no more than 9 fishing days for seine and drift gillnet gear but no harvest limits. Prior to the 2004 fishing season, many of the restrictions in place from 2001 to 2003 were replaced by a set fishing schedule, which is currently still in effect. Sockeye salmon harvests from 2004 through 2006 averaged 486,817 in the South Unimak and 608,103 in the Shumagin Islands June fisheries for an average total harvest of 1,094,920. This average total harvest was lower than the 1975–2000 average, but above the 2001–2003 average. Chum salmon harvests from 2004 through 2006 for the South Unimak and Shumagin Islands June fisheries average 123,480 and 279,842, respectively. The average chum salmon harvest was below the 1975–2000 average total harvest, and above the 2001–2003 average (Appendix Table A18; Figure 6). The 2004–2006 average exvessel value for the June South Alaska Peninsula fishery was $3,716,011 (Poetter 2006).

Salmon runs were substantially better in 2003, 2004, 2005 and 2006 than in previous years across a broad region of western Alaska, including the Yukon River in Alaska and Canada. However, they were still below average. The world catch of Chinook salmon has dropped significantly since the late 1970’s, but has rebounded some since the low in 2001 (Figure 7). The world chum catch remains high with most of the harvest by Japan (Figure 8). The causes for the production failures are not known, but attention has focused on the marine environment because of the broad scope of the production failures. Likely factors that have received the most attention to date have included the effects of El Nino, ocean and climate regime shifts, and competition relative to ocean carrying capacity (i.e., hatchery/wild interactions). Nearly half the abundance of chum salmon in the North Pacific Ocean is now due to hatchery releases (Figure 9).

10.2 Bering Sea and Gulf of Alaska Groundfish Fishery

10.2.1 History and Management of the Groundfish Fishery

The U.S. groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) and in the Gulf of Alaska (GOA) are managed under the Magnuson-Stevens Fisheries Conservation and Management Act by the North Pacific Fishery Management Council (NPFMC), and are regulated by the National Marine Fisheries Service (NMFS).

In general, the groundfish fisheries of the GOA are managed and regulated separately from those in the BSAI. Both major areas contain a number of smaller regulatory areas, which are numbered. The groundfish fisheries east of 170° west longitude and north of the Alaska Peninsula are considered to be in the BSAI (Figures 10 and 11). The groundfish fisheries operating in waters south of the Alaska Peninsula and east of 170° west longitude are considered to be in the GOA.

The U.S. groundfish fishery off the coast of Alaska expanded rapidly during the last 15 years. In 1977, the year after the Magnuson Act went into effect, the U.S. groundfish harvest off Alaska amounted to 2,300 metric tons (mt, 1 mt = 2,204.6 pounds), or 0.2% of the total groundfish harvest off Alaska by all nations. Most of that U.S. catch was Pacific halibut caught with hook and line gear.

The Magnuson Act, which claimed exclusive fishery jurisdiction by the United States of waters to a distance 200 nautical miles seaward from the coast, allowed the U.S. to gradually replace the foreign groundfish fisheries by "joint-venture" fisheries, in which U.S. fishermen caught the fish and delivered them at sea to foreign fish processing vessels. The joint-venture fishery, in turn, was replaced by an entirely U.S. fishery. The estimated exvessel value of the total Alaskan commercial fisheries from 1982 through 2006 is given in Appendix Table A19 and Figure 12.

The U.S. groundfish fisheries use three types of fishing gear: trawls, hook and line (including longline and jig), and pots. Of these types of fisheries, trawlers have by far the greatest impact on salmon bycatch numbers.

A major issue affecting the BSAI and GOA groundfish fisheries was a NMFS biological opinion, which concluded that continued fishing for groundfish, including pollock, Atka mackerel and Pacific cod, under the agency's existing rules is likely to jeopardize the western population of Steller sea lions and adversely affect its critical habitat. Many of the North Pacific Councils actions in 2001 were related to Steller sea lion protection measures establishing temporal and spatial dispersion of harvest and protection of Steller sea lion critical habitat. There will now be two seasons for the pollock, Atka mackerel and Pacific cod fisheries and the amount taken within sea lion critical habitat will be limited. Among several documents prepared in accordance with the National Environmental Policy Act of 1969, NMFS published a Final Programmatic SEIS for the Alaska Groundfish Fisheries, a Final SEIS for Steller Sea Lion Protection Measures in the Alaska Groundfish Fisheries, and a Draft EIS for the essential fish habitat components of the several fishery management plans. The Western Alaska Community Development Quota (CDQ) Program, which has six groups representing the 65 western Alaska communities that are eligible, expanded from pollock only to all federally managed BSAI groundfish species. Currently, the CDQ program has allocated portions of the groundfish fishery that range from 10% for pollock to 7.5% for most other species. On January 1, 2000, the License Limitation Program (LLP) required that any person who wished to deploy a harvesting vessel in the king and Tanner crab fisheries in the BSAI and in the directed groundfish fisheries (except for IFQ sablefish, and for demersal shelf rockfish east of 140 degrees West longitude) in the GOA or the BSAI must hold a valid groundfish or crab license (as appropriate) issued under the LLP.

10.2.2 Observer Program

Under U.S. law and regulations, salmon may not be retained by the U.S. groundfish fishery and must be returned to the sea. One exception is the voluntary Salmon Donation Program, which allows for distribution of Pacific salmon taken as bycatch in the groundfish trawl fisheries off Alaska to economically disadvantaged individuals by tax exempt organizations through a NMFS authorized distributor. This action supports industry initiatives to reduce waste from discard in the groundfish fisheries by processing salmon bycatch for human consumption. The groundfish observer program began in 1977 on foreign groundfish vessels operating within the U.S.

Exclusive Economic Zone (200 nautical miles from the U.S. shore). It continued with the joint-venture fishery until its end. Until 1990, however, there was little information on the accidental or incidental catch of salmon by the U.S. groundfish fishery.

In 1990, the United States began a scientific observer program for the U.S. groundfish fishery off the coast of Alaska. In general, a groundfish harvesting or processing vessel must carry a NMFS certified observer on board whenever fishing or fish processing operations are conducted if the operator is required by the NMFS Administrator, Alaska Region, NMFS, (Regional Administrator) to do so, and a shoreside groundfish processing plant must have a NMFS certified observer present whenever groundfish is received or processed if the plant is required to do so by the Regional Administrator.

The amount of observer coverage is usually related to the length of the vessel or the amount of fish processed by a shoreside plant or mothership processing vessel. Groundfish harvesting vessels having a length of 125 feet or more are required to carry observers at all times when they are participating in the fishery. Vessels with lengths between 60 through 124 feet are required to carry observers during 30% of their fishing days during trips when they fish more than 3 days. Vessels shorter than 60 feet do not have to carry observers unless required to do so by the Regional Administrator. Mothership or Shoreside processing plants processing 1,000 metric tons (mt) or more per month are required to have 100 percent observer coverage, those processing between 500 and 1,000 mt per month are required to have 30 percent coverage, and those processing less than 500 mt per month need no observer coverage unless it was required specifically by the Regional Administrator.

Observers must be trained and certified. To be certified as an observer by the NMFS, an applicant must have a bachelor’s degree in fisheries, wildlife biology, or a related field of biology or natural resource management. Observers must be capable of performing strenuous physical labor, and working independently without direct supervision under stressful conditions. Because observers are not employees of the Federal Government but instead hired by certified contractors, applicants must apply directly to a certified contractor. If hired, the contractor will arrange for them to attend a 3-week observer training course in Seattle or Anchorage. Upon successful completion of the course, they will be certified as a groundfish observer.

In addition to the observer coverage, all groundfish harvesters over 60 feet and processors must maintain and submit logbooks on their groundfish harvests and their catch of the prohibited species, including crabs, halibut, herring, and salmon.

In 2006, a draft Environmental Assessment/Regulatory Impact Review (EA/RIR) was released to examine the environmental and economic effects of BSAI Amendment 86 and GOA Amendment 76 to restructure the North Pacific Groundfish Observer Program (Observer Program). The proposed action is intended to address a variety of longstanding issues associated with the existing system of observer procurement and deployment. At its February 2003 meeting, the Council approved the following problem statement for restructuring the Observer Program:

BSAI Amendment 86/GOA Amendment 76 Problem Statement

The North Pacific Groundfish Observer Program (Observer Program) is widely recognized as a successful and essential program for management of the North Pacific groundfish fisheries. However, the Observer Program faces a number of longstanding problems that result primarily from its current structure. The existing program design is driven by coverage levels based on *vessel size that, for the most part, have been established in regulation since 1990. The quality and utility of observer data suffer because coverage levels and deployment patterns cannot be effectively tailored to respond to current and future management needs and circumstances of individual fisheries. In addition, the existing program does not allow fishery managers to control when and where observers are deployed. This results in potential sources of bias that could jeopardize the statistical reliability of catch and bycatch data. The current program is also one in which many smaller vessels face observer costs that are disproportionately high relative to their gross earnings. Furthermore, the complicated and rigid coverage rules have led to observer availability and coverage compliance problems. The current funding mechanism and program structure do not provide the flexibility to solve many of these problems, nor do they allow the program to effectively respond to evolving and dynamic fisheries management objectives.*

At its February 2006 meeting, the Council identified Alternative 2 (extension of the existing program) as the preliminary preferred alternative. The Council also approved an addition to the problem statement as follows:

While the Council continues to recognize the issues in the problem statement above, existing obstacles prevent a comprehensive analysis of potential costs. Immediate Council action on a restructured program is not possible until information is forthcoming that includes clarification of cost issues that arise from Fair Labor Standards Act and Service Contract Act requirements and statutory authority for a comprehensive cost recovery program. During the interim period, the Council must take action to prevent the expiration of the existing program on December 31, 2007.

Also at its February 2006 meeting, the Council recommended that a new amendment proposing restructuring alternatives for the Observer Program should be considered by the Council at such time that: (1) legislative authority is established for fee-based alternatives; (2) Fair Labor Standards Act (FLSA) issues are clarified (by statute, regulation, or guidance) such that it is possible to estimate costs associated with the fee-based alternatives; and/or (3) the Council requests reconsideration in response to changes in conditions that cannot be anticipated at this time. The Council also recommended that subsequent amendment packages regarding the Observer Program should include an option for the Federal funding of observers.

The Council requested that NMFS prepare a discussion paper on issues and internal agency process for the use of video equipment to complement and augment observer monitoring of the North Pacific groundfish fisheries under the current service delivery model.

In identifying Alternative 2 as its preliminary preferred alternative, the Council was responding to a letter from NMFS Alaska Region dated January 22, 2006, in which NMFS recommended extending the existing program under Alternative 2 until a number of critical cost-related issues could be resolved. In its letter, NMFS recommended that the Council adopt Alternative 2 to maintain the current program until cost issues are able to be analyzed and statutory barriers to fee collection are resolved.

Development of the current suite of alternatives

Because previous attempts to restructure the program had not been successful, NMFS, Council staff, and the Observer Advisory Committee (OAC) originally considered a stepwise approach in this amendment package. This was based on the concept that it might be effective to undertake a less ambitious restructuring effort focused primarily on those regions and fisheries where the problems of disproportionate costs and coverage are most acute. The intent was that once a restructured program had been implemented successfully for some fisheries, the Council could decide whether or not to proceed with expanding the program to include additional fisheries. The initial alternatives approved by the Council in April 2003 reflected this approach, and focused primarily on the groundfish and halibut fisheries of the GOA, with options to include BSAI groundfish vessels that currently have less than 100% coverage requirements. In December 2003, the Council reviewed a preliminary draft analysis of the impact of those alternatives that were focused primarily on the GOA.

As NMFS began to evaluate alternatives under this scenario, however, concerns arose that certain operational and data quality issues would be difficult to resolve under a "hybrid" system (with some fisheries covered by a new program and others continuing to operate under the old system) and that, in fact, some of these problems would likely become exacerbated under such a system. NMFS identified a range of operational and data quality issues associated with the current model. These included the agency's inability to: determine where and when observer coverage takes place on less than 100% observed sectors of the fleet; match observer skill level with deployment complexity; reduce observer coverage for sectors of the fleet that are now subject to 100% or greater coverage levels; and implement technological innovations which might meet monitoring needs while reducing observer coverage costs and expenses.

At the February 2004 Council meeting, NMFS described the above concerns and informed the Council that the agency had determined that effective procedures for addressing observer performance and data quality issues could only be addressed through a service delivery model that provided direct contractual arrangements between NMFS and the observer providers. NMFS thus recommended that the Council include an additional alternative to the draft analysis that would apply the proposed direct contract model program-wide, so that all observer services in the Federal fisheries of both the BSAI and the GOA would be provided by observer companies through direct contracts with NMFS.

At its June 2004 meeting, the Council approved seven alternatives distinguished primarily by scope that ranged from a new program for GOA groundfish fisheries only to a comprehensive program for all groundfish and halibut fisheries off Alaska. At its June 2005 meeting, the Council decided to consolidate.

Summary of the Alternatives

The Council identified Alternative 2 as its preliminary preferred alternative in February 2006, for various reasons related to Congressional authority and cost uncertainties. However, the analysis continues to evaluate all five primary alternatives, including the three restructuring alternatives that are less viable alternatives at this time.

The Council intends to initiate a new amendment with restructuring alternatives at such time that: (1) legislative authority is established for fee based alternatives; (2) the FLSA issues are clarified (by statute, regulation, or guidance) such that it is possible to estimate costs associated with the fee based alternatives; and/or (3) the Council requests reconsideration in response to changes in conditions that cannot be anticipated at this time. Thus, should the Council choose Alternative 2 as its final preferred alternative at final action, it is intended that the analysis of the restructuring alternatives would be used as a starting point in a future amendment, to be initiated at such time as described above.

Alternative 1. No action alternative. Under this alternative, the current interim "pay as you go" program would continue to be the only system under which groundfish observers would be provided in the groundfish fisheries of the BSAI and GOA. Regulations authorizing the current program expire at the end of 2007, meaning that no action is not a viable alternative over the long-term.

Alternative 2. Rollover alternative. Extension of the existing program (preliminary preferred alternative). Under this alternative, the 2007 sunset date for the existing program would be removed and the program would be extended indefinitely with no changes to the overall service delivery model until the Council took further action. Because unresolved issues related to labor costs prevent a comprehensive analysis of potential costs, and the Council currently lacks the statutory authority to implement the funding mechanisms proposed in Alternatives 3 through 5, immediate Council action on a restructured program is not possible. This alternative would prevent the existing program from expiring until such time that comprehensive restructuring may be possible.

Alternative 3. GOA-based restructuring alternative. Restructured program for GOA groundfish and all halibut fisheries; rollover existing program in BSAI. A new exvessel value fee program would be established to fund coverage for GOA groundfish vessels, GOA-based processors, and halibut vessels operating throughout Alaska. Regulations that divide the fleet into 0%, 30%, and 100% coverage categories would no longer apply to vessels and processors in the GOA. Fishermen and processors would no longer be responsible for obtaining their own observer coverage. NMFS would determine when and where to deploy observers based on data collection and monitoring needs, and would contract directly for observers using fee proceeds and/or direct Federal funding. Vessels in the GOA would be required to carry an observer when one is provided by NMFS. Under this alternative, the current "pay as you go" system would be unchanged for all groundfish vessels and processors that operate in the BSAI. Vessels and processors that operate in both management areas would obtain their observer coverage and pay fees through whichever program applies to the management area in which they are currently operating.

Alternative 4. Coverage-based restructuring alternative. Restructured program for all fisheries with coverage less than 100% (Tiers 3 and 4). This alternative differs from Alternative 3 in that the program would be defined by coverage categories rather than geographic area. All vessels and processors assigned to Tiers 3 and 4 (i.e. that require less than 100% coverage) would participate in the new program throughout Alaska and pay an exvessel value based fee. In general, this alternative would apply to all halibut vessels, all groundfish catcher vessels <125' LOA and all non-AFA shoreside processors. All vessels and processors assigned to Tiers 1 and 2 (100% or greater coverage) would continue to operate under the current "pay as you go" system throughout Alaska.

Alternative 5. Comprehensive restructuring alternative. Restructured program for all groundfish and halibut fisheries off Alaska. This alternative would establish a new fee-based groundfish observer program in which NMFS has a direct contract with observer providers for all GOA and BSAI groundfish and halibut vessels. Under this alternative, vessels with 100% or greater coverage requirements would pay a daily observer fee and vessels with coverage requirements less than 100% would pay an exvessel value based fee.

The entire 398 page document can be accessed at the following web site:

http://www.fakr.noaa.gov/npfmc/current_issues/observer/OPO606.pdf

10.2.3 Estimated Catch of Salmon in the Groundfish Fisheries

NMFS estimates the number of salmon caught in the groundfish fisheries from the observer reports and the weight of groundfish caught. Observers are instructed to collect random samples of each net haul before it has been sorted, and to gather information from each salmon in a haul. Observers record the species caught and the number of each species, determine the sex of dead or dying salmon, record the weight and length of each salmon, collect scales, and check for missing adipose fins. If a salmon is missing its adipose fin, the observer removes and preserves the snout, which may contain a coded wire tag.

NMFS scientists then use the number of salmon of each species caught in each haul sampled, the weight of groundfish caught in each haul sampled, and the total weight of groundfish harvested during the sampling period to estimate the total number of salmon of each species caught by the entire groundfish fleet. Appendix Table A20 and Figure 13 present a summary of the estimated numbers of Chinook and other salmon caught by the U.S. groundfish fisheries from 1990 through 2006. Appendix Table A20 indicates that the number of salmon caught by the groundfish fisheries varies considerably by species of salmon, by year, and between the BSAI and the GOA. For the most part, Chinook and chum salmon make up most of the catch, with coho a distant third, and sockeye and pink salmon minor components.

The catch of salmon in the BSAI in 2006 was 85,764 Chinook and 326,296 other salmon and in the GOA the salmon catch was 17,577 Chinook and 4,746 other salmon. Certain areas in the BSAI have been declared salmon savings areas for both chum and Chinook salmon (Figures 10 and 11) based on high rates of catch in the past.[18] After the 1998 season, because of the concerns regarding Chinook salmon conservation in western Alaska and in response to a proposal submitted by BSFA, the NPFMC lowered the allowable bycatch of Chinook salmon in the BSAI trawl fishery.

Because of the record numbers of salmon taken in the BSAI in 2003 and 2004 and information from the fishing fleet indicating that catch was exacerbated by the savings areas the NPFMC is evaluating BSAI salmon management measures. In December 2004, the NPFMC approved a draft problem statement and five alternatives for initial consideration to address the salmon catch problem. In January 2006, the NPFMC staff released a Public Review Draft entitled "Environmental Assessment/Regulatory impact Review/Initial Regulatory Flexibility Analysis for Modifying Existing Chinook and Chum Salmon Savings Areas." The full 326-page document can be viewed at the NPFMC web site:

http://www.fakr.noaa.gov/npfmc/current_issues/bycatch/bycatch.htm

Basically, three alternatives are being considered:

Alternative 1. Status Quo. Alternative 1 maintains the existing regulatory measures for Chinook and Chum salmon savings area closures.

Alternative 2. Eliminate the regulatory salmon savings area closures. Under Alternative 2, the catch limits for the Bering Sea subarea trawl Chinook and BSAI trawl chum salmon would be eliminated, and would no longer trigger savings area closures. The annual closure of the Chum

[18] Information on past and present bycatch of salmon in the BSAI and GOA groundfish fisheries can be obtained from the NMFS Alaska Region web page at www.fakr.noaa.gov

Salmon Savings Area would also be eliminated. Salmon would remain a prohibited species under this (and all) alternative.

Alternative 3. Suspend the regulatory salmon savings area closures and allow pollock cooperatives and CDQ groups to utilize their voluntary rolling hot spot closure system to avoid salmon bycatch. Under Alternative 3, the catch limits for the Bering Sea subarea trawl Chinook and BSAI trawl chum salmon would be suspended, and would no longer trigger savings area closures. The annual closure of the Chum Salmon Savings Area would also be suspended. The suspension will go into effect so long as the pollock cooperatives and CDQ groups have in place an effective salmon bycatch voluntary rolling “hot spot” (VRHS) closure system to avoid salmon bycatch.

In addition, a motion was introduced in October, 2005 that states “The Council and NMFS have initiated action to exempt AFA qualified and CDQ vessels participating in the intercooperative voluntary rolling hotspot system (VRHS) from regulatory Bering Sea salmon bycatch savings areas.”

The ESA incidental take statement from the 1999 Salmon Biological Opinion is 55,000 Chinook salmon in the BSAI and 40,000 Chinook salmon in the GOA. On December 1, 2004, NMFS, Alaska Region reinitiated formal Section 7 consultation with NMFS, Northwest Region on the ESA listed Chinook salmon incidental takes in the BSAI groundfish fishery because the groundfish fisheries exceeded the amount stated in the incidental take statement in 2004.

One of the big unanswered questions is what stocks of salmon are being caught by the U.S. groundfish fisheries and how many of each stock. Some information comes from coded wire tagged salmon recovered by observers. But that information only shows that certain coded wire tagged stocks are caught, it says nothing specific about the many stocks without coded wire tags. Canada has coded wire tagged upper Yukon River Chinook salmon for a number of years. To date, 16 have been recovered in the Bering Sea groundfish fisheries and three were picked up by the U.S BASIS cruise in 2003 (Appendix Table A20; Figure 14). In addition, 10 Chinook salmon that have been captured on the high seas and tagged, have returned to the Yukon Drainage (Figure 14).

10.3 LAW ENFORCEMENT

10.3.1 JAPAN

Enforcement Activities in 2006

Japan reported deployment of a total of 37 patrol vessels for a total of 361 days between February and October, 2006. Air patrols were operated by aircraft and helicopters for 112 hours. Japan also made a joint operation with the USCG using JCG Gulf V. There were no fishing activities targeting salmon in the Convention Area (Figure 15).

However, Japan reported the sighting of 50 vessels engaged in driftnet fishing activities or rigged for driftnet. Many of these vessels were later thought to be Chinese as identified by their vessel types, Chinese characters used for vessel names, and from the fact that many squid jigging vessels flying Chinese flag were sighted nearby. Some of these jigging vessels attempted to obstruct patrol vessels’ course to prevent sighting.

The Government of Japan is currently requesting form the Government of China, through diplomatic channels, to provide details of these vessels for the purpose that appropriate measures be taken by China to penalize them in accordance with Chinese domestic laws, if the vessels are confirmed as Chinese.

Japan proposed that the NPAFC President write an official letter to request that the Government of China take preventative measures to ensure that Chinese vessels are not involved in driftnet fishing, which could adversely affect salmon stocks in the Convention Area. Japan also proposed to express in the letter the Commission's concerns of the increased number of Chinese vessels equipped with driftnets given that the Chinese government has received a similar report from Japan in recent years.

Korea concurred with the Japanese proposal. Korea asked Japan what response Japan had received from China to previous years' Japanese requests. Japan answered that in response to previous sighting reports, which were provided to the Chinese government, China reported that it had taken measures in accordance with Chinese domestic laws and charged penalties where fishing vessels and their violations were identified. They believe China is trying to address the problem of IUU fishing by driftnet vessels, but the numbers of sightings are still increasing.

Russia concurred with the proposal to send the letter as well as increasing the NPAFC patrol efforts. The United States also supported the Japanese proposal and suggested the letter not be accusatory but that it should point out the cooperative measures, which have already taken place between the NPAFC and the Chinese government. The United States has a bilateral Chinese/US MOU for carrying Chinese shipriders aboard US Coast Guard cutters. The United States noted that the Western and Central Pacific Fisheries Commission (WCPFC) is also concerned with the same problems regarding the use of the high seas driftnets and plans to create some measures to combat it. Canada agreed with the proposal and agreed that the letter should not have an accusatory tone.

The chairman suggested that Japan draft the letter describing our patrol activities and that the Commission and the Government of China be partners to combat the illegal fishing activities. The draft letter would then be sent to the Parties through the Secretariat for review and comments before sending it to the Chinese government.

10.3.2 RUSSIA

Enforcement Activities in 2006

Russia reported that the FSS patrolled during the period of spawning migration of Pacific salmon from May until August. Seven patrol vessels and three aircraft participated in patrolling the Convention Area. Vessels patrolled for 62 days covering 1875 nautical miles. Aircraft patrolled 3340 nautical miles with six sorties. Most of the patrols took place in the northern part of the Convention Area. No violations with the Convention were observed during the patrolling of the Convention Area.

Planned Activities in 2007

Sakhalin Border Service will have a priority for patrolling next year, given that the recent sightings near the Russian EEZ in Convention Area are closer to their patrol assets ports. Russia welcomes the possibility of planning more internationally combined patrolling with the United States and Canadian assets, both surface and aircraft.

10.3.3 UNITED STATES

Enforcement Activities in 2006

LCDR Ragone reported the US enforcement activities for the 2006 season. The United States had a successful high level of cooperation to combat IUU operations. It also had a successful joint exercise using a Japanese G-V flight this year, which was a landmark event. USCG patrols did not detect any vessels actively engaged in fishing contrary to the Convention and no boardings were conducted by USCG cutters. There were HSDN-rigged vessels sighted by the Canadian deployment, which were reported by the Canadian Party in Document 990. Upon receiving the Canadian sighting information, the information was relayed to Japan, Russia and China for a possible multi-nation joint response, however, due to lack of asset availability at that time, only Russia could respond to the calls. However, Russia reported that the vessels were gone from the area when they arrived on scene.

Planned Activities in 2007

USCG will patrol with its HC-130 aircraft at resource levels similar to recent years in order to meet the high seas driftnet fishing threat. USCG high endurance cutters will continue to be scheduled to patrol in areas of the US EEZ and high seas, giving them the capability to respond to any potential violators in the Convention Area. NOAA/NMFS will continue to place officers on Canadian high seas driftnet flights during 2007 deployments and patrols with USCG HC-130 deployments when able. The USCG intends to continue issuing Local Notices to Mariners prior to and during the high threat season and partner with other NPAFC Parties to provide more detailed information on HSDN to mariners on an internet web site.

The United States plans to deploy aircraft from Alaska and Hawaii as well as receiving reports from US fishermen. The United States also hopes to cooperate with Western and Central Pacific Fisheries Commission (WCPFC).

10.3.4 CANADA

Enforcement Activities in 2006

Canada reported the Preseason meetings with the USCG, the Canadian Department of Fisheries and Oceans (DFO), and the Department of National Defense (DND) were held in Victoria, B.C. on April 27, 2006. They discussed and developed a detailed operational plan for the Canadian patrols based out of Shemya.

Canadian patrols in 2006 were conducted during two periods (June 1–10 and September 7–14) using 14 aerial patrols with a total of 168 hours flown. Two operations were conducted by two CP-140 aircraft with a NMFS officer aboard, based out of Shemya Island, Alaska. The 2006 patrol area was slightly decreased from 2005. The general patrol area was west of 175° West to the Russian EEZ and north of 38° North to the US EEZ off Alaska. During the first period, two vessels rigged for driftnet netting were sighted without fishing activities observed. During the second period, 27 vessels rigged for driftnet netting were sighted, of which 12 vessels were observed with nets in the water that ranged from less than 2.5km (1.5 miles) up to 7 nautical miles. Most of the vessels bore neither flags nor names.

Detailed suspected driftnet vessels' photos were presented. The Department of Defense is currently enhancing the photo quality for further details and once it is recovered, the information will be posted on the IIS.

Russia asked Canada whether the vessel "*IRIDA*" had salmon on board. Canada responded that their aircraft could not confirm the product on board, however, the vessel was rigged similar to high seas driftnet vessels, which were noted in previous years. Canada also reported that there were no nets sighted aboard the vessel or in the waters near the vessel. The patrol aircraft did not have enough fuel to remain at low level for further investigation, but when aircraft returned to the area, there were no further sightings of "*IRIDA*".

Russia agreed to investigate this case further in hopes of determining what kind of fish/product were delivered, and inform the Parties of the result of the investigation.

Japan noted, when reviewing the Canadian report, that it looked for the same vessels, but did not find any of the same names. Canada thanked Japan for the feedback at this meeting.

Planned Activities in 2007

Canada will commit 180 hours of air surveillance time. The timing of its patrol efforts will be informed through the Joint Operations Information Coordination Group.

10.3.5 TAIWAN

Pursuant to the United Nations General Assembly (UNGA) Resolutions on prohibiting high sea driftnet fishing, Taiwan has been undertaken measures to prohibit Taiwanese vessels from engaging in activities of driftnet fishing in North Pacific Ocean since 1993, including dispatching of patrol vessels to the North Pacific Ocean to monitor fishing activities of Taiwanese vessels.

It is noted, that there were no Taiwanese vessels engaging in driftnet fishing activities in the North Pacific Ocean after 1993, but Taiwan continues to send patrol vessels to the North Pacific Ocean to examine whether its nationals are involved in driftnet fishing activities of vessels flying the flag of other countries.

To further promote the exchange of information on monitoring activities in the North Pacific Ocean, Taiwan has provided the Secretariat of NPAFC with information on a Taiwan monitoring operation plan in 2006, before the patrol vessels from Taiwan's Coast Guard Administration were departing for the North Pacific Ocean.

From June 14 to November 5, 2006, Taiwan has sent three patrol vessels as part of this monitoring operation in the area of 35°-45°N, 145°–180°E.

On August 23, 2006, the patrol boat, "*Hsun Hu No.2*", sighted the driftnet fishing vessel "*Meriyana*" at 42°11'N, 158°27'E in the North Pacific Ocean. The vessel "*Meriyana*" did not fly any flag and did not display its registration port or a radio call sign. On October 16, the patrol vessel "*Hsun Hu No.3*" sighted two unknown driftnet fishing vessels at 41°26'N, 150°55'E. On that day, "*Hsun Hu No.3*" also sighted two driftnet fishing vessels "Don Yuan Yu No.62602" and "Don Yuan Yu No.66021" at 41°21.5'N, 150°48.1'E. On October 17, the official from the Fisheries Agency of Taiwan informed the members of NPAFC of these two cases.

To prevent flagged vessels and Taiwanese nationals from engaging in driftnet fishing activities in the North Pacific Ocean, Taiwan will continue to implement existing management measures. Further, as the high sea driftnet fishing is regarded as an international illegal activity, Taiwan will continue to cooperate and exchange information with all concerned countries.

10.4 BERING SEA RESEARCH

10.4.1 Background

Extensive research has begun in the Bering Sea in the last few years focusing on physical and biological oceanography and climate change. Many different organizations from several countries have been involved, and several international organizations have been formed to try to coordinate this research. The discussion that follows will concentrate on those studies directed towards Pacific salmon.

10.4.2 Bering-Aleutian Salmon International Survey

The Bering-Aleutian Salmon International Survey (BASIS) is an NPAFC-coordinated program of ecosystem research on salmon in the Bering Sea. The major goal of this program, which was developed in 2001, is to clarify how changes in the ocean conditions affect the survival, growth, distribution, and migration of salmon in the Bering Sea. Research vessels from US (*F/V Sea Storm*, *F/V Northwest Explorer*), Japan (*R/V Kaiyo maru*, *R/V Wakatake maru*), and Russia (*R/V TINRO*), have participated in synoptic BASIS research surveys in Bering Sea since in 2002.

The primary findings from the past 5 years (2002–2006) indicate that there were special variations in distribution among species: juvenile coho salmon and Chinook salmon tended to be distributed nearshore and juvenile sockeye salmon, chum salmon and pink salmon tended to be distributed further offshore. In general, juvenile salmon were largest during 2002 and 2003, and smallest during 2006, particularly in the northeast Bering Sea region. Fish, including age-0 pollock and Pacific sand lance were important components of the diets for all species of juvenile salmon in some years. However, annual comparisons of juvenile salmon diets indicated a shift in primary prey for many of the salmon species during 2006 in both the northeast and southeast Bering Sea regions. In addition, the average CPUE of juvenile salmon fell sharply during 2006 in the southeast Bering Sea region. We speculate that spring Sea Surface Temperatures (SSTs) on the eastern Bering Sea shelf likely impact growth rate of juvenile western Alaska salmon through bottom up control in the ecosystem. Cold spring SSTs lead to lower growth and marine survival rates for juvenile western Alaska salmon, while warm spring SSTs have the opposite effect.

Stock mixtures of salmon from BASIS surveys in the Bering Sea have provided new information on oceanic migration and distribution of regional stock groups in the Bering Sea. Recent results from Japanese surveys indicate that 81% of the immature chum salmon in the Bering Sea basin were from Asian (Russia and Japan) populations during August–September in 2002. Results from US surveys on the Bering Sea shelf and Aleutian chain indicate considerable spatial variation in stock mixtures; however, when pooled over location mixtures were very similar to mixtures present in the basin with 80% of the immature chum salmon from Asian populations. Immature chum salmon from western Alaska comprised 2% and 8% of immature chum salmon on the southern Bering Sea shelf and northern Bering Sea shelf, respectively. Stock mixtures of juvenile chum salmon have identified where migratory routes of western Alaska and Russian chum salmon stocks overlap and has helped identify the contribution of Russian stocks to the total biomass of juvenile chum salmon on the eastern Bering Sea shelf.

Sato et al. (2006) used mitochondrial (mt) DNA and single nucleotide polymorphism (SNP) markers to estimate the stock origins of chum salmon caught in the western North Pacific Ocean and central Gulf of Alaska. Most young chum salmon (ocean age 1) were collected at three stations in the western North Pacific Ocean (42°30’–44°30’N, 165°E), while most of older chum salmon (ocean age 2–5) were collected at seven stations in the Gulf of Alaska (48–54°N, 145°W). In the central Gulf of Alaska, the stock composition of ocean age 2–5 chum salmon estimated by mtDNA analysis was 70–92% North American stock in the north area (51–54ºN), while the Japanese and Russian stock contributions were 54–78% in the south area (48–50ºN). An mtDNA stock estimate of ocean age 1 chum salmon in the western North Pacific Ocean was 17% Japanese, 67% Russian, and 16% North American stocks (Figure 16). SNP analysis showed a similar estimate (25.0% Japanese, 60.3% Russian, and 14.7% North American stocks), but the 90% confidence intervals were tighter than those of mtDNA analysis, maybe due to a difference in number of markers (Figure 17).

Kate Myers of the University of Washington, Fisheries Research Institute has summarized the results of high seas salmon tagging data from 1954 to 2005. She will be presenting the results at the spring 2007 Panel meeting in Anchorage. Figures 18 to 23 show locations and numbers of released tagged salmon over the 50-year period. Figures 24 to 31 show the known distribution of AYK salmon in the Bering Sea and North Pacific Ocean. Results show the presence of AYK pink, chum, sockeye, and coho salmon in the Gulf of Alaska early in the year, and a return to the Bering Sea by mid to late summer. AYK Chinook salmon did not migrate south of the Aleutian Peninsula (Figures 31 and 32). Immature Yukon and Kuskokwim Chinook salmon migrate westward past the 180° line almost to the Russian coastline (Figure 31). Canadian Yukon River hatchery Chinook salmon recoveries were all east of the 180° line (Figure 32).

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FIGURES

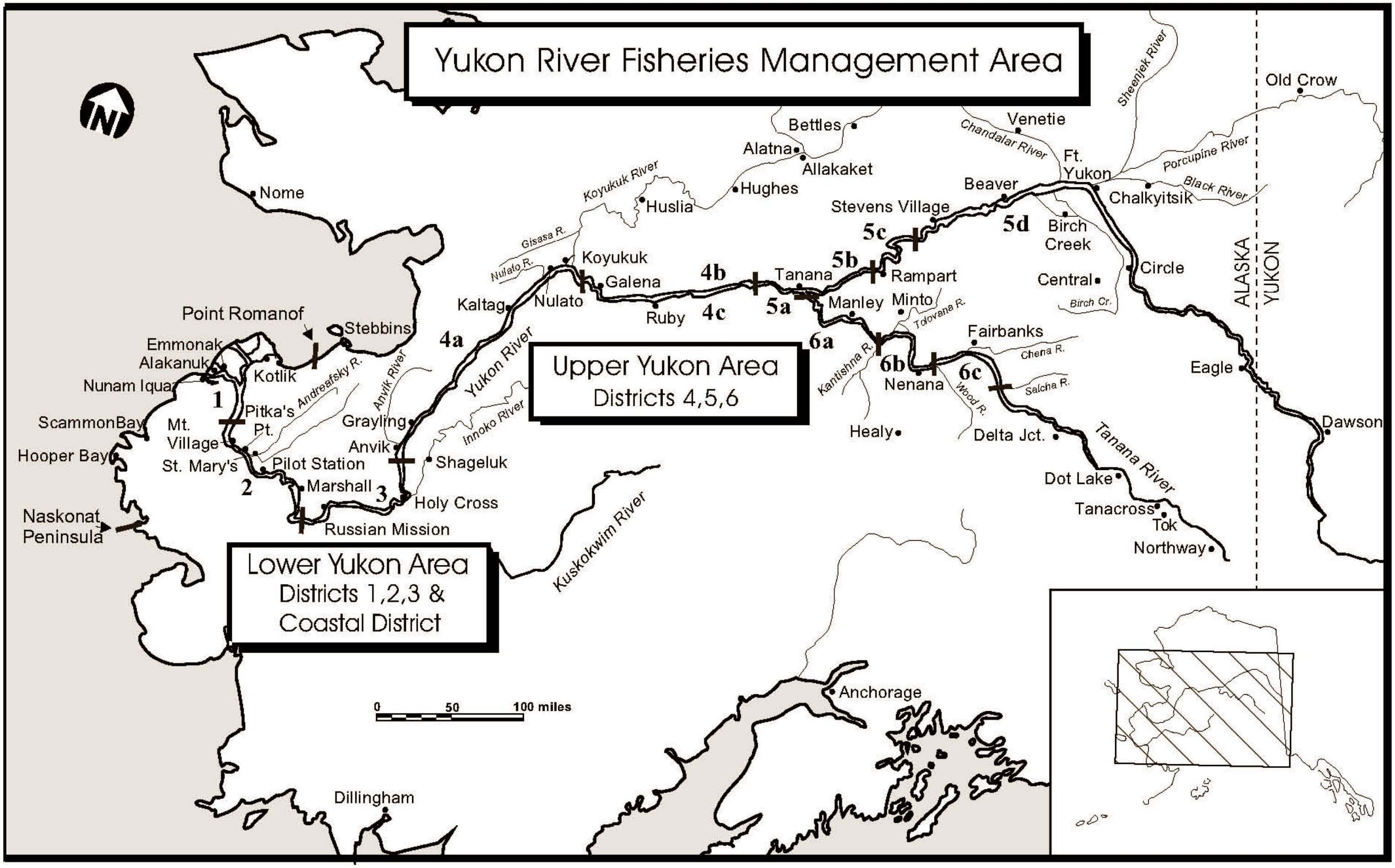
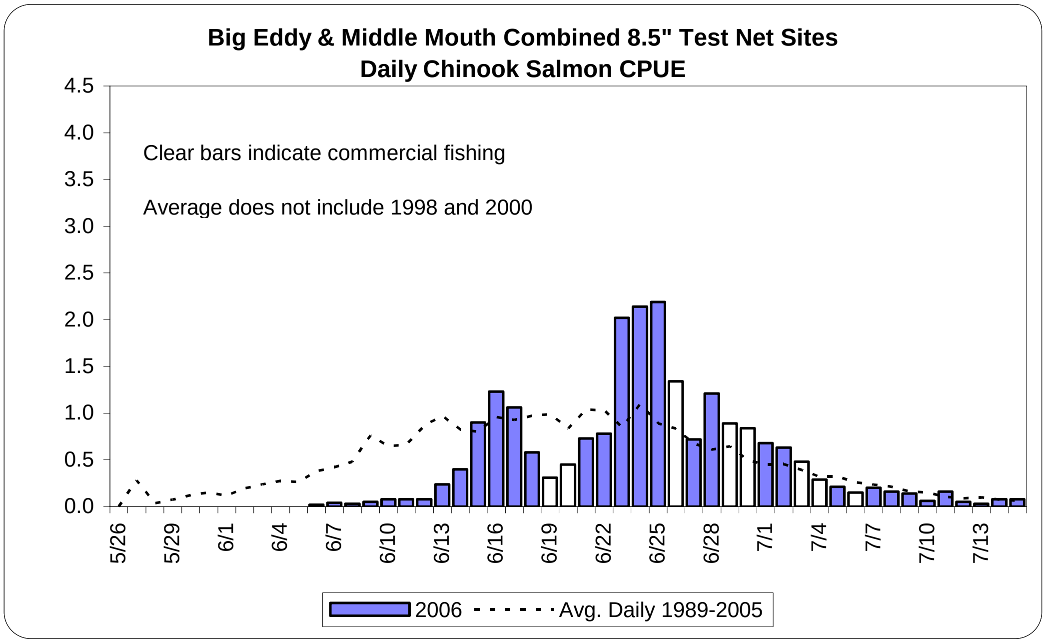
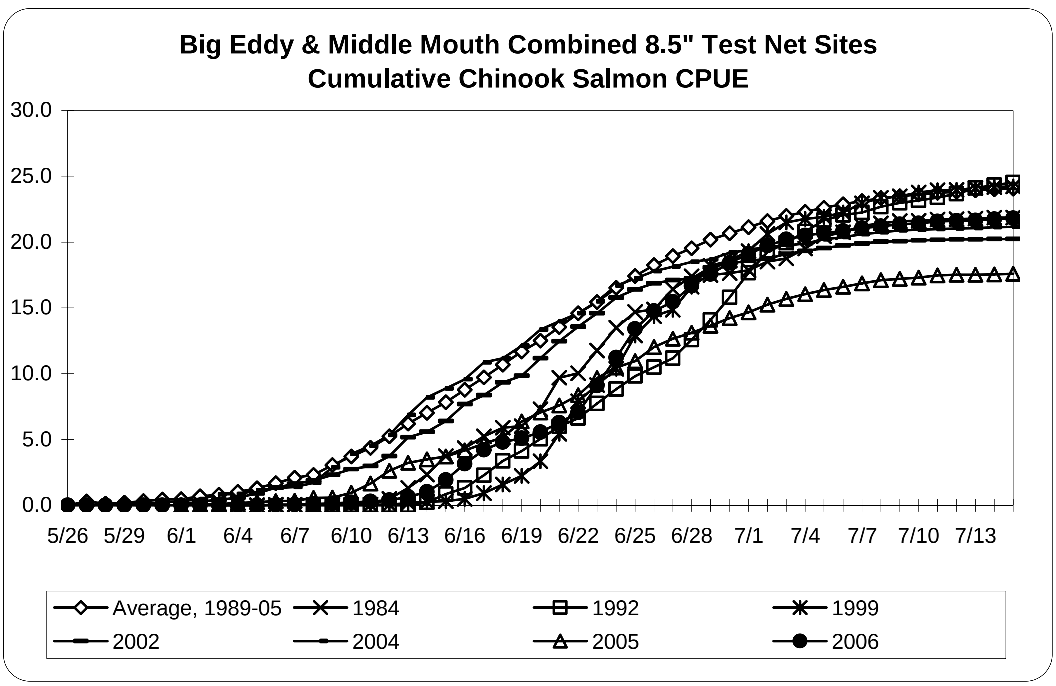


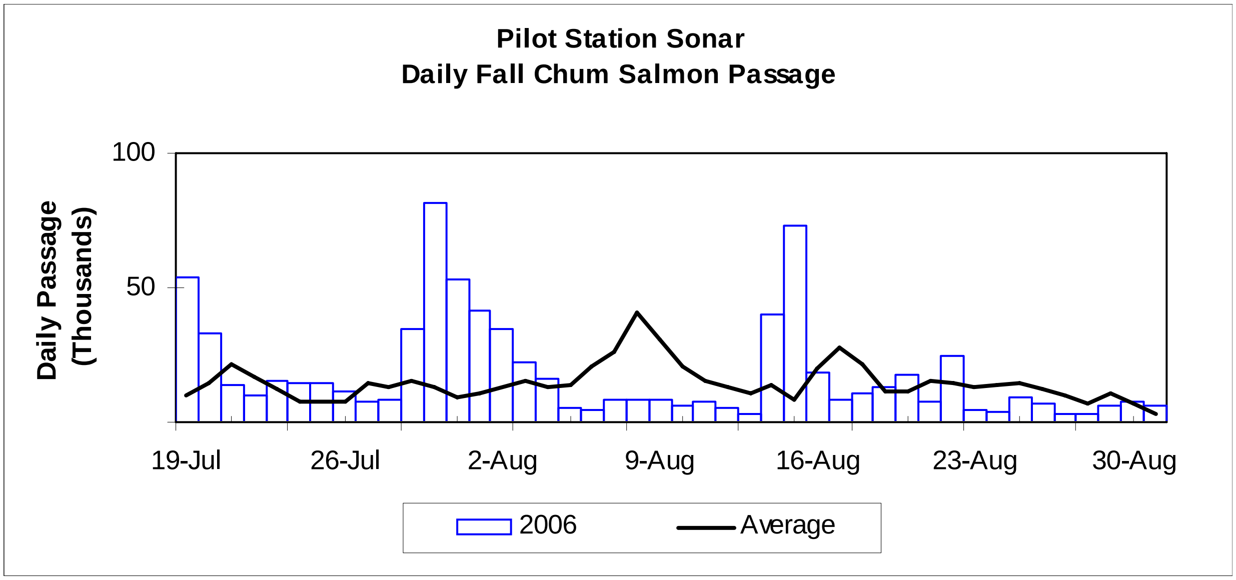
Figure 1.–Alaska portion of the Yukon River drainage showing communities and fishing districts.





Note: Average is without 1998 and 2000.

Figure 2.–Daily test fish CPUE for Chinook salmon test fish sites 2006 compared to the 1989–2005 average (above). Cumulative test fish CPUE for Chinook salmon test fish sites in 2006 (below) compared to the1989–2005 average CPUE.



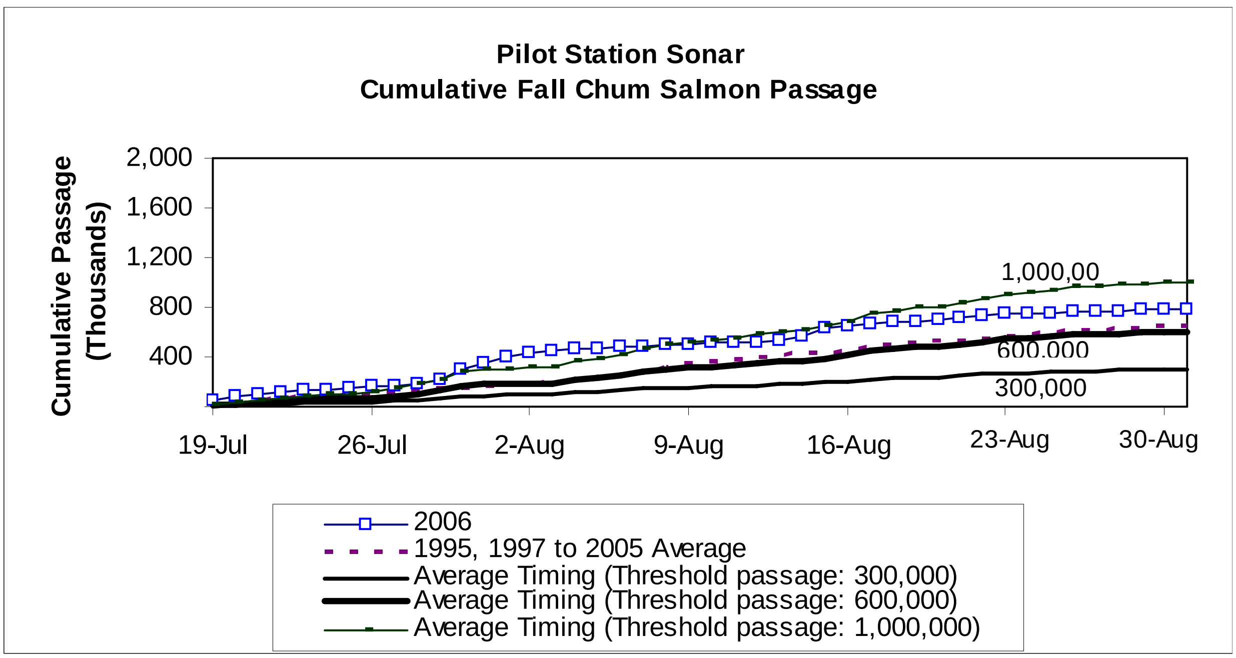


Figure 3.–Daily Pilot Station sonar passage counts attributed to fall chum salmon in 2006 (top), compared to 1995 and 1997 through 2005 average. Cumulative Pilot Station sonar passage counts attributed to fall chum salmon in 2006 (bottom), compared to 1995 and 1997 though 2005 average.

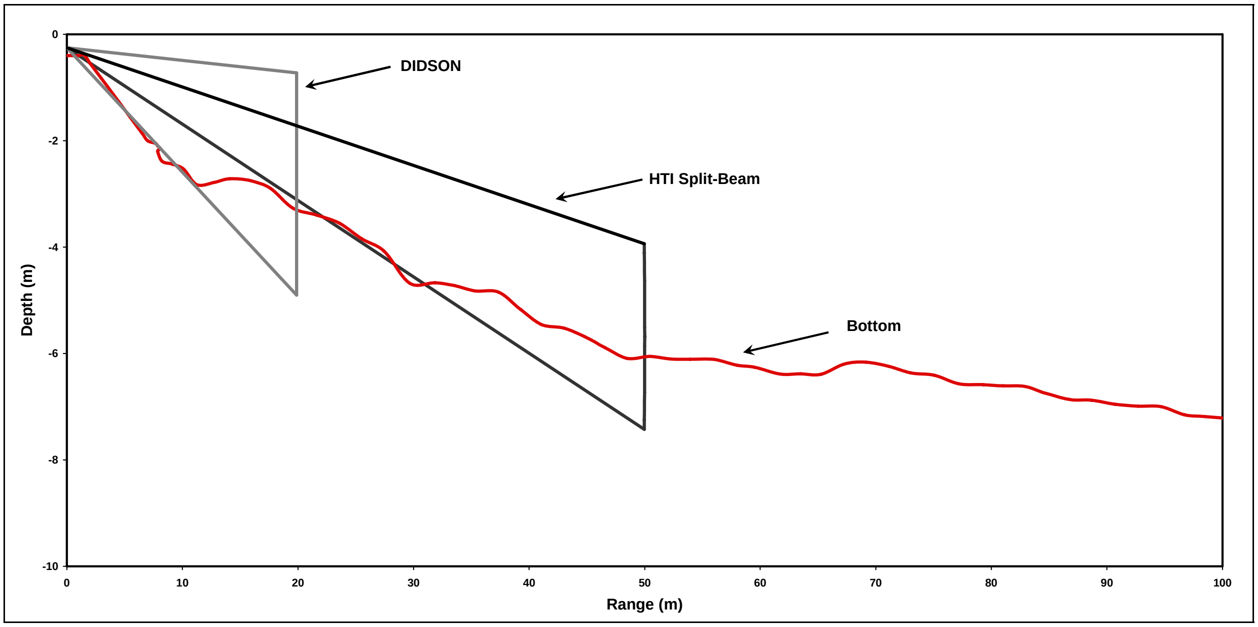


Figure 4.–Schematic representation of the approximate river profile in 2005 and associated nominal beam-width of the DIDSON™ and split-beam sonar of the first sampling stratum on the left bank.

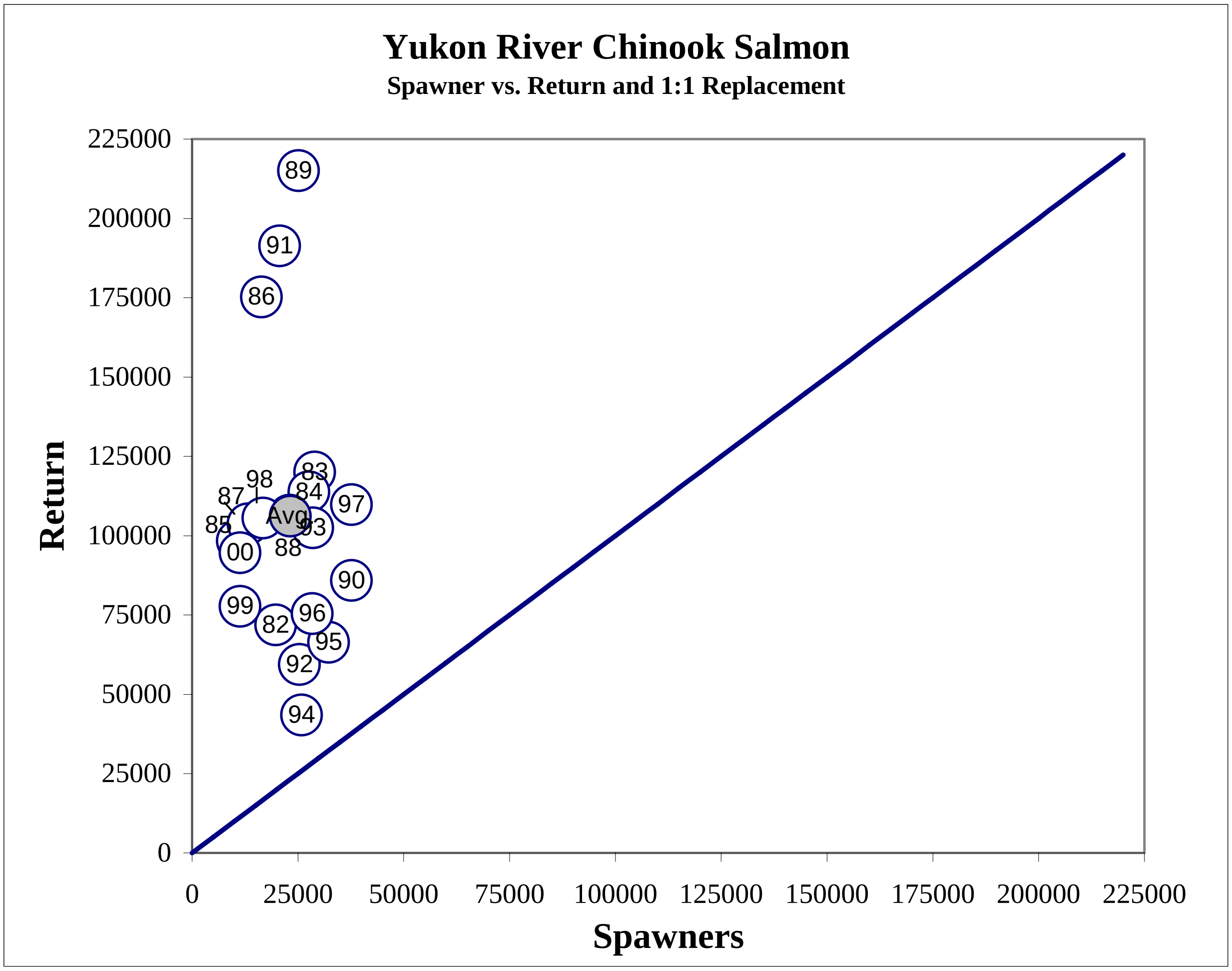


Figure 5.–Yukon River mainstem Canadian Chinook salmon spawners versus estimated returns and the 1:1 replacement line. Years in the figure represent the brood years. The years in the circles represent brood years and the shaded circle presents the average.

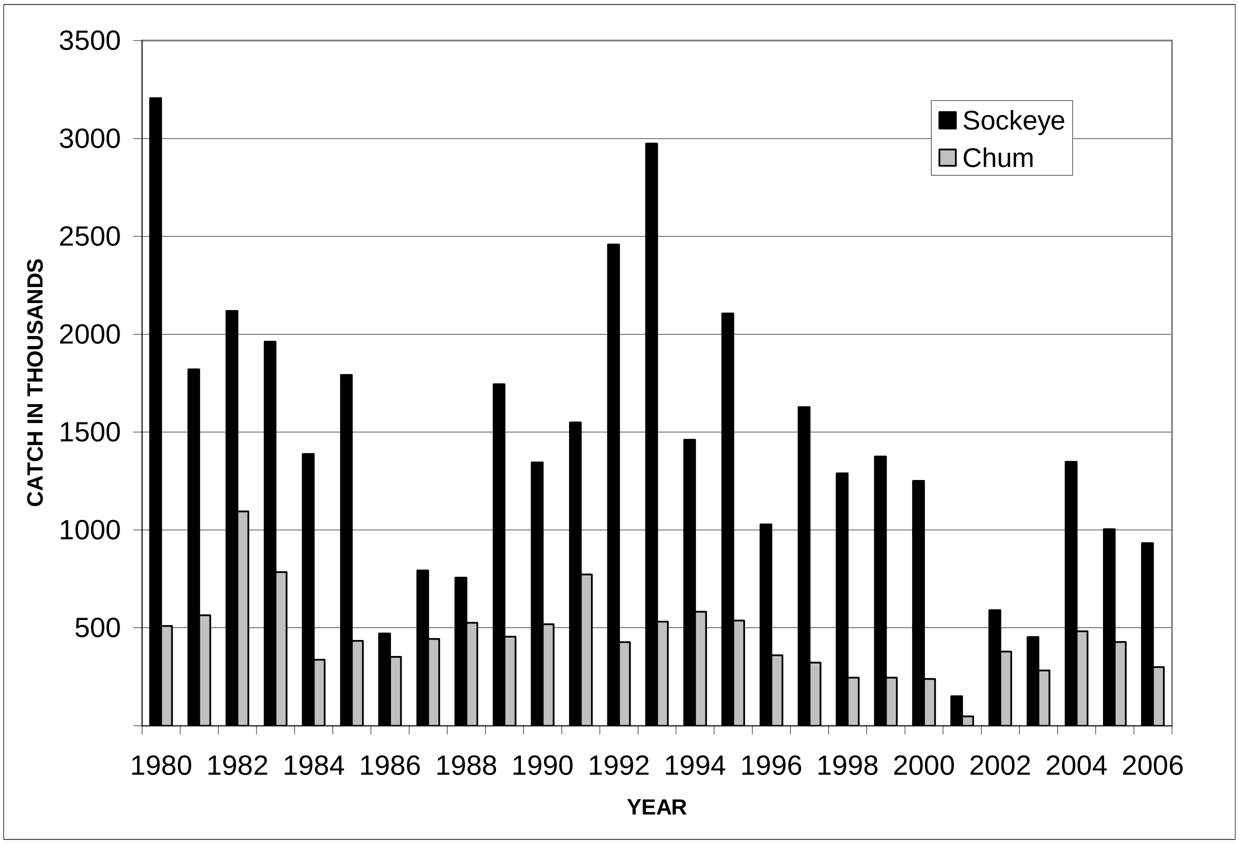


Figure 6.–Sockeye and chum salmon catch in the South Peninsula June fishery, 1980–2006.

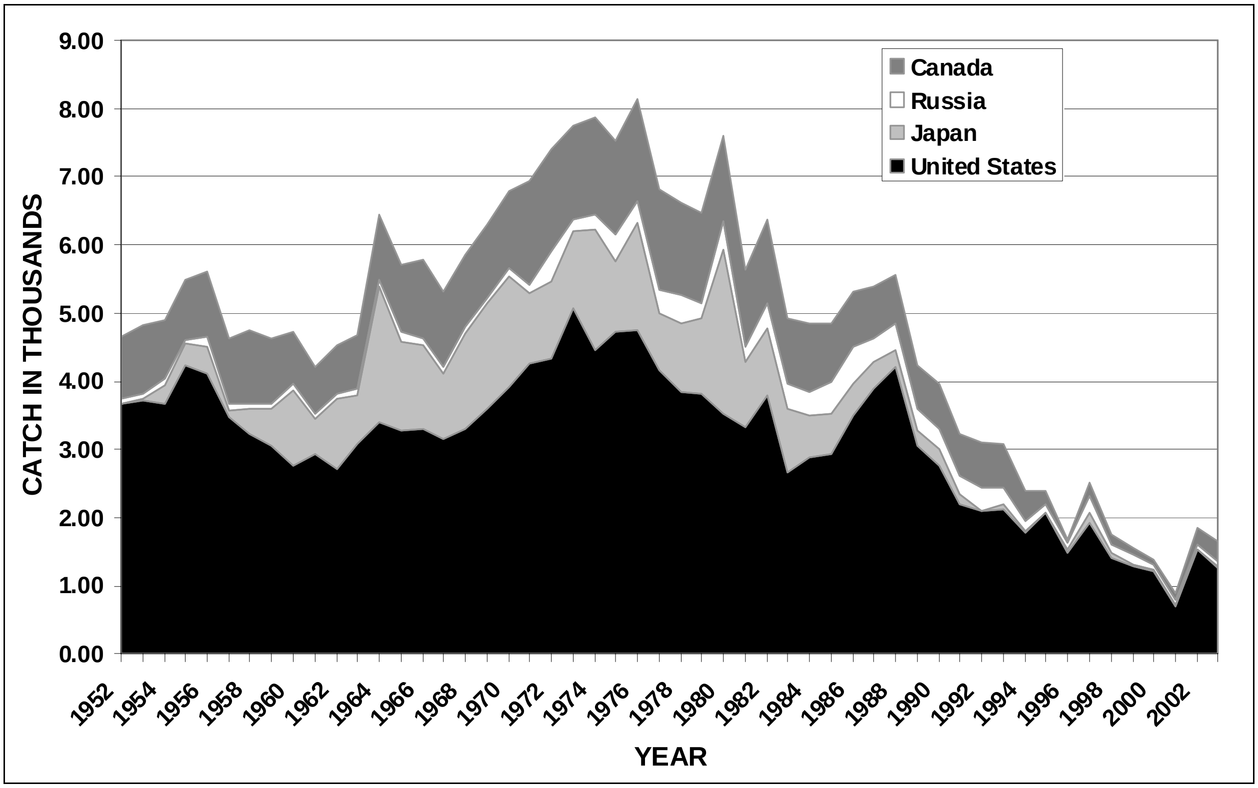


Figure 7.–World Chinook salmon catch, 1952–2003.

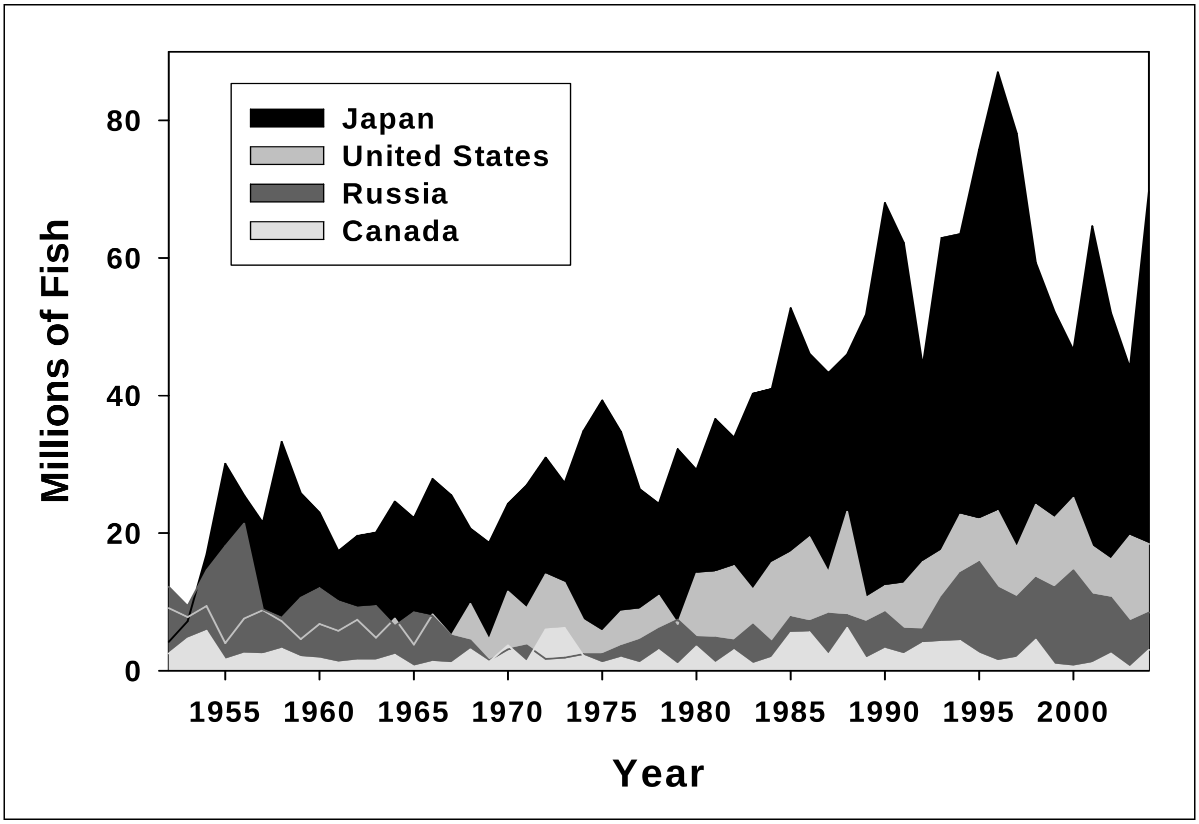
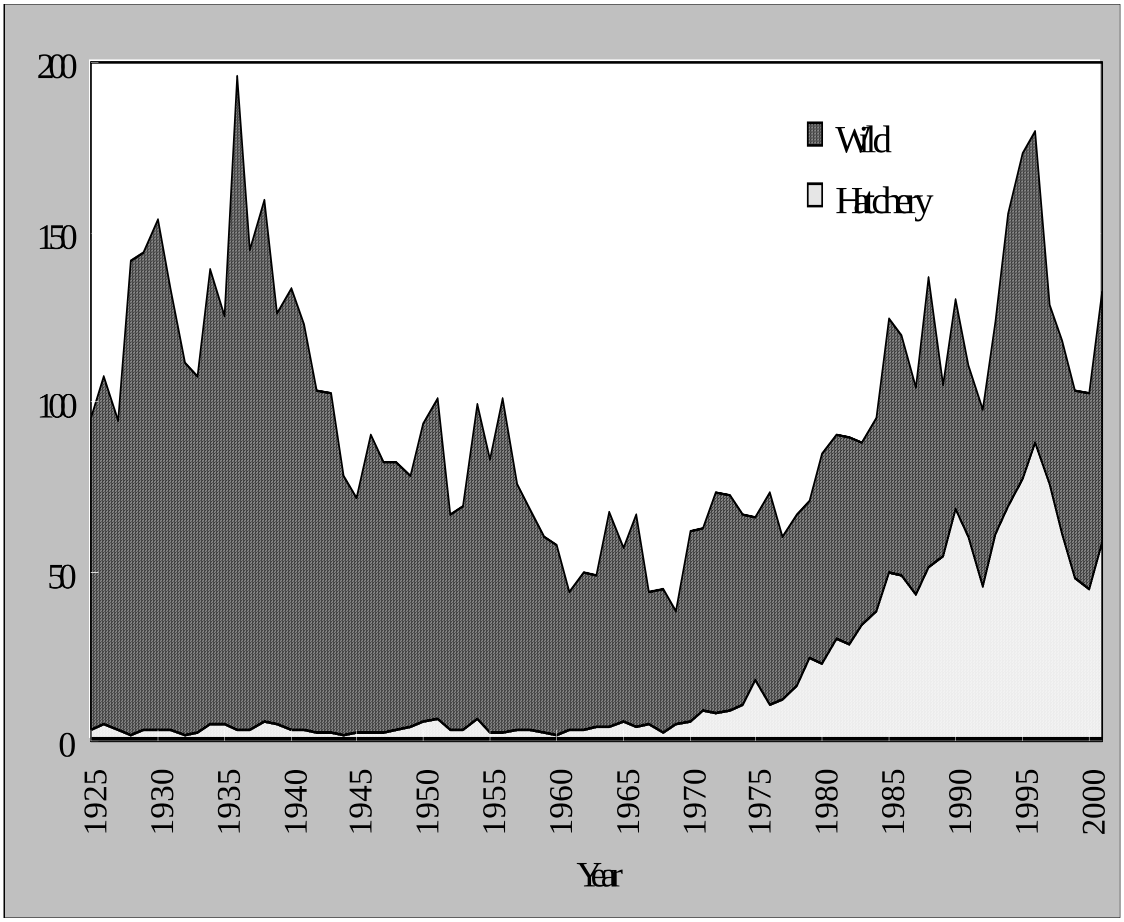


Figure 8.–World chum salmon catch, 1952–2004.



Source: Kaeriyama 2003.

Figure 9.–Number of wild and hatchery chum salmon in the North Pacific Ocean 1925–2002.

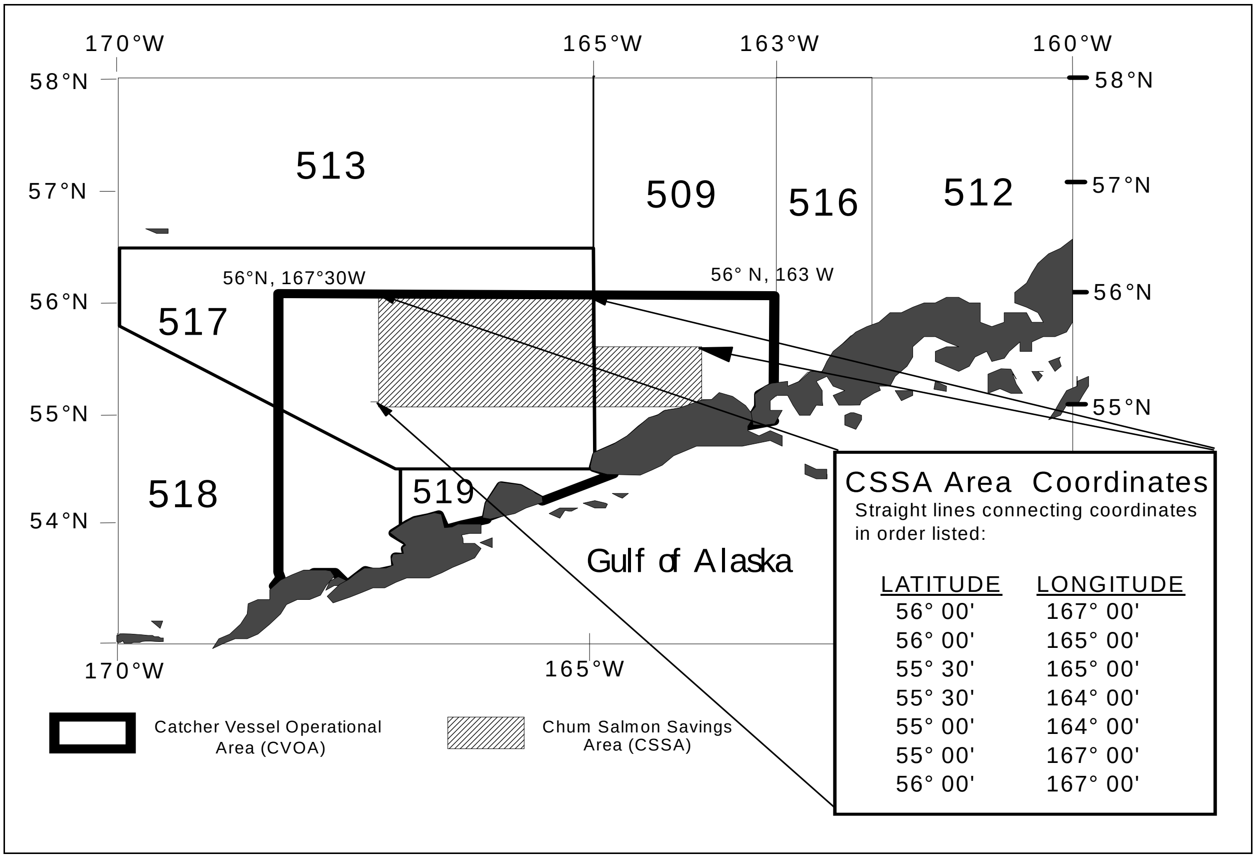


Figure 10.–Statistical reporting areas and chum salmon savings area for the US groundfish fisheries in the Bering Sea.

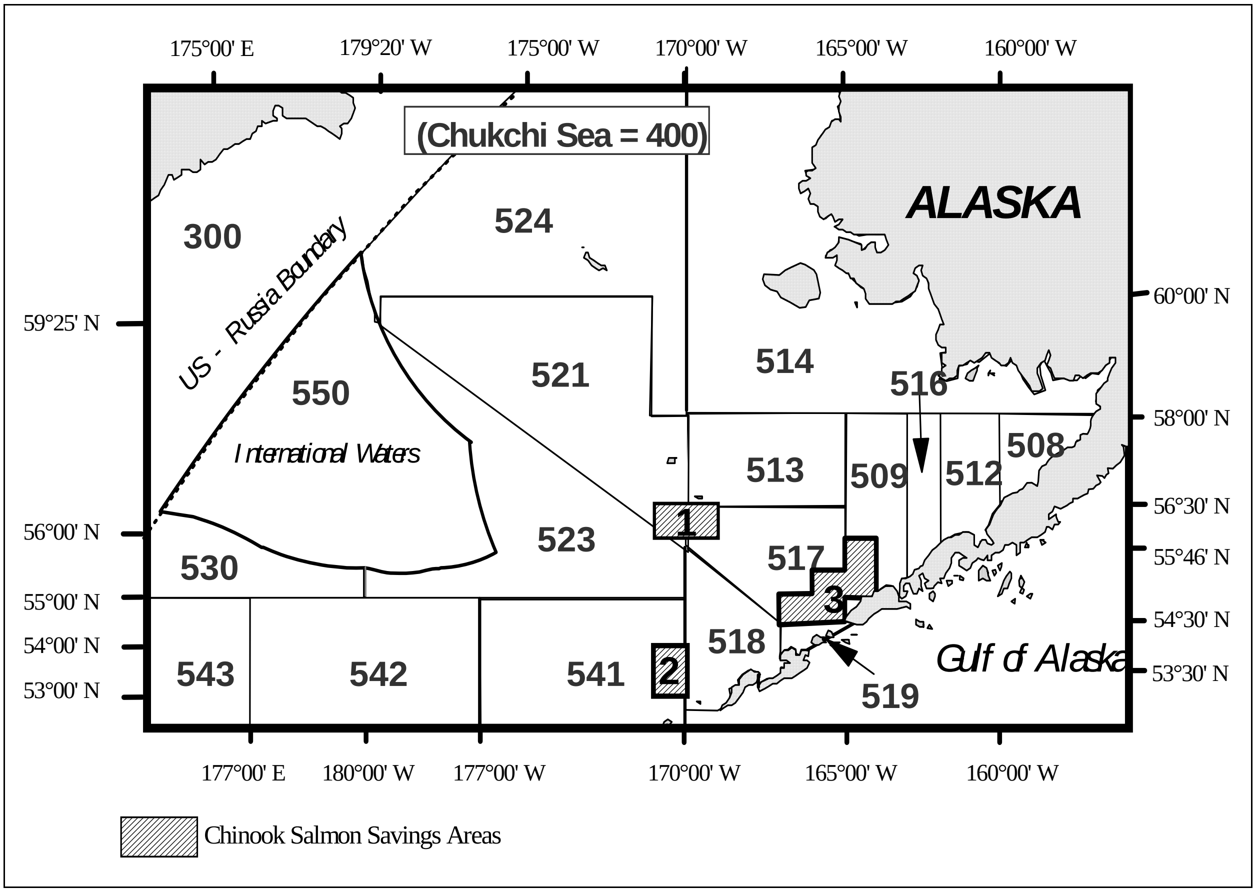


Figure 11.–Statistical reporting areas and Chinook salmon saving areas for the US groundfish fisheries in the Bering Sea.

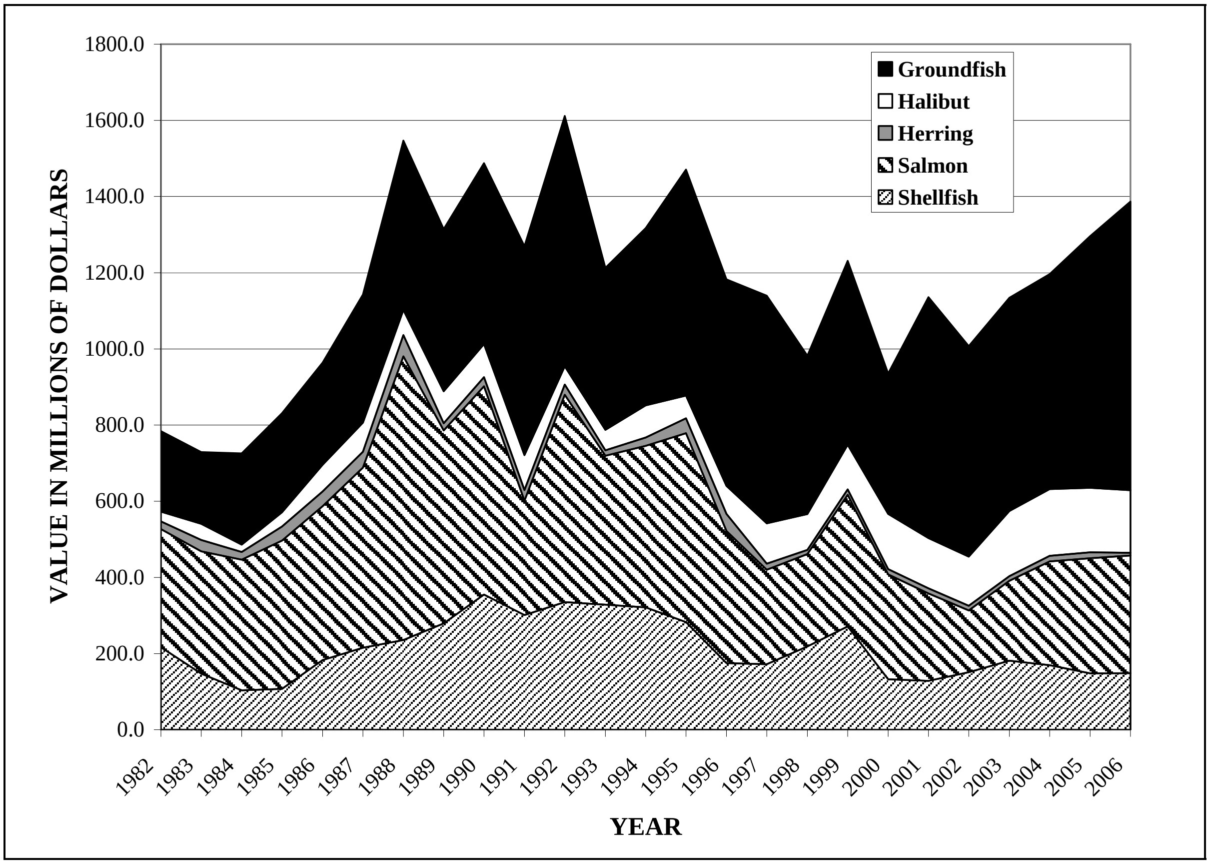


Figure 12.–Exvessel value of the catch in the commercial fisheries off Alaska by species in millions, 1982–2006.

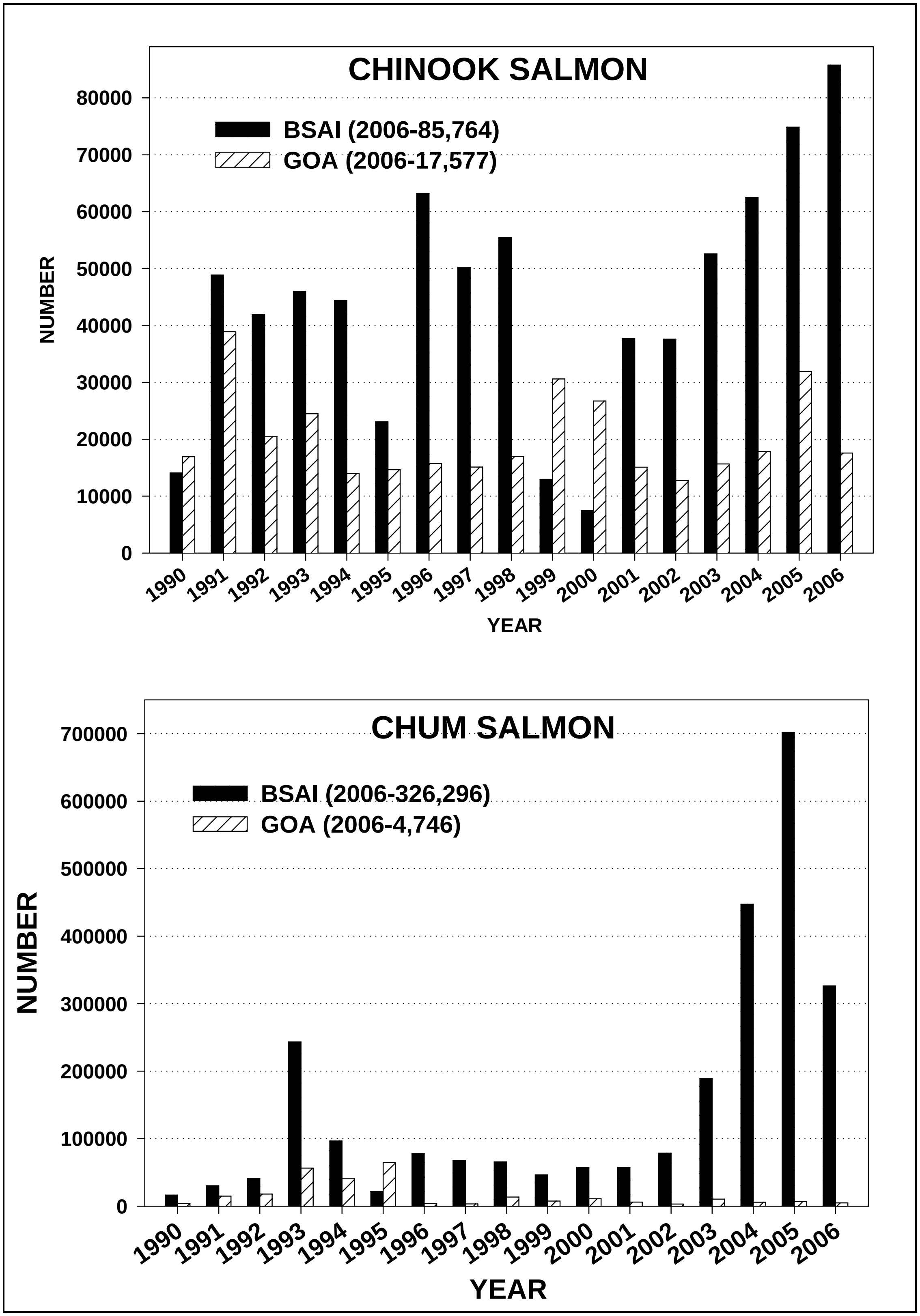


Figure 13.–Salmon bycatch in the Gulf of Alaska and Bering Sea Groundfish fishery, 1990–2006.

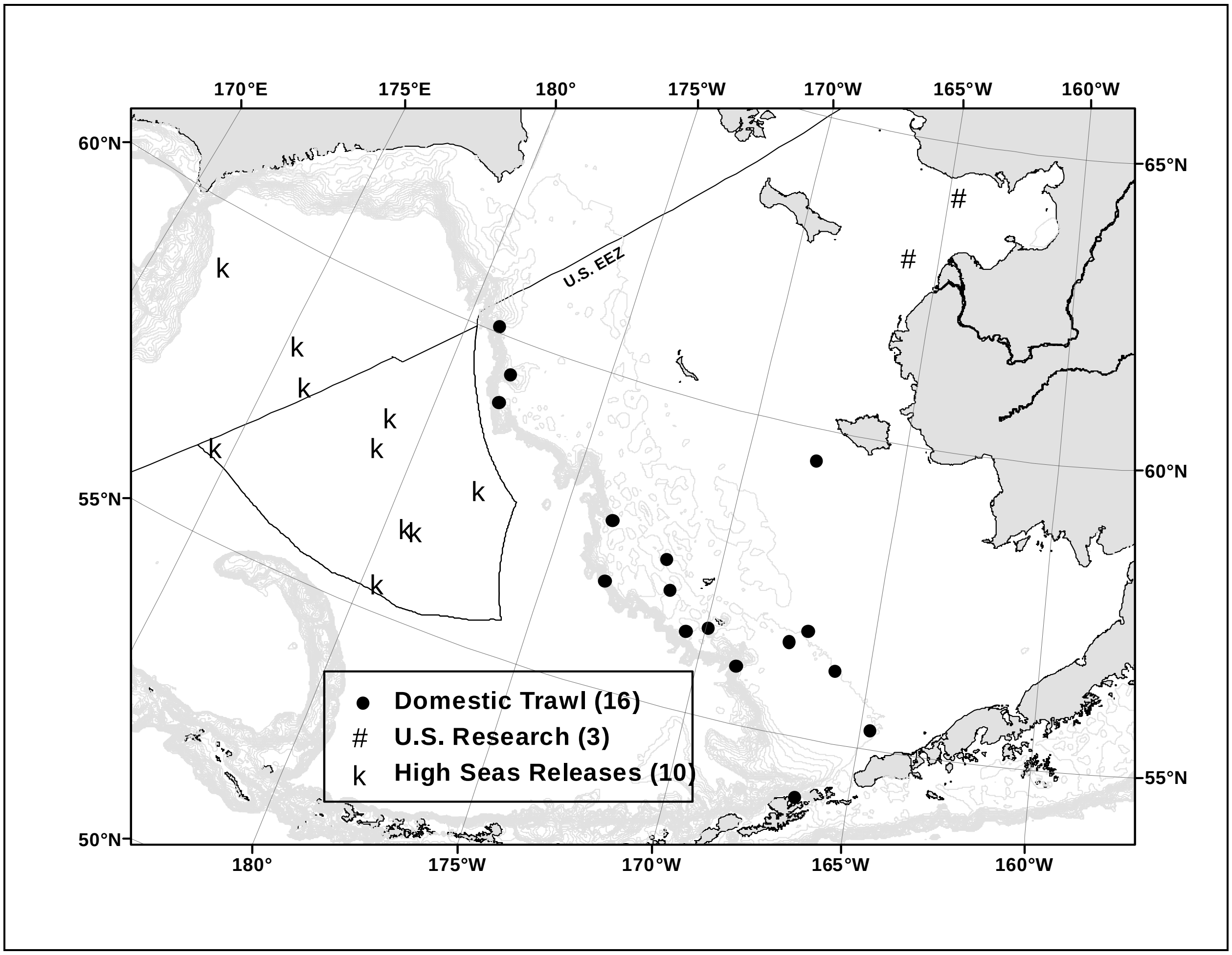


Figure 14.–Coded wire tagged Chinook salmon from the Whitehorse hatchery recovered from the domestic and research catches in the Bering Sea, and high seas tagged Chinook salmon recovered in the Yukon River.

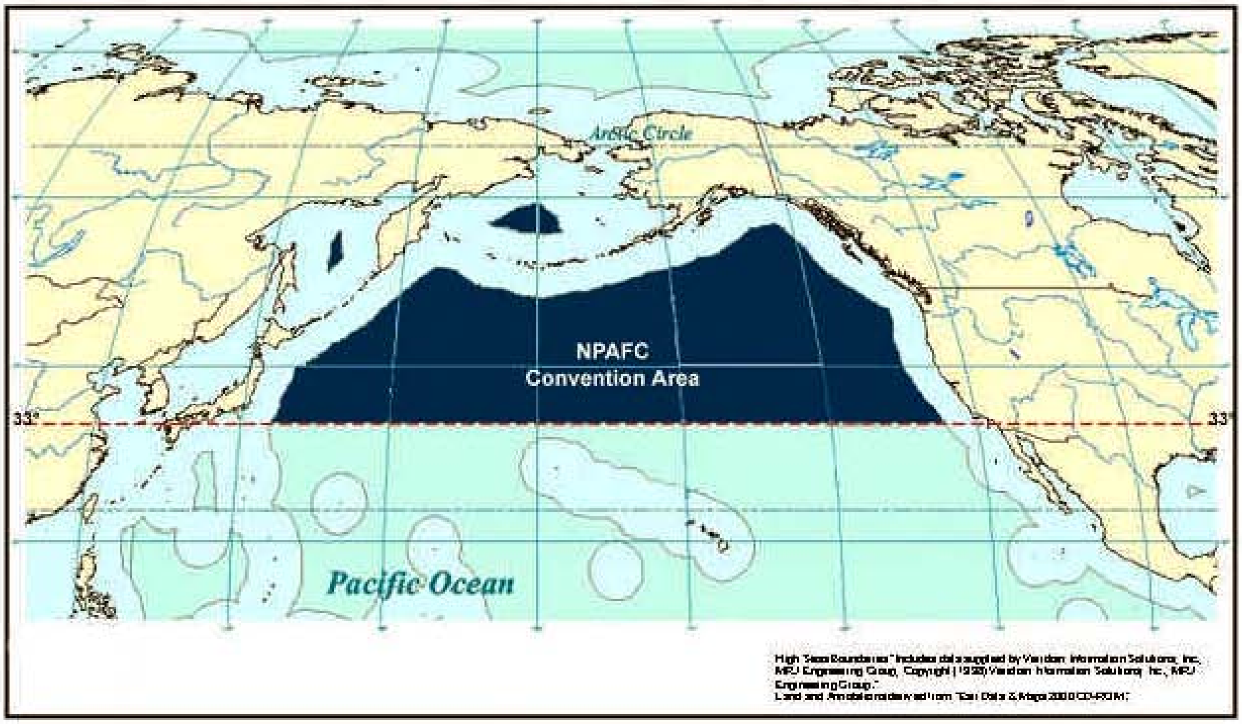


Figure 15.–The Convention prohibits direct fishing for anadromous fish (chum, coho, pink, sockeye, Chinook, and cherry salmon, and steelhead trout) in the Convention Area. The incidental taking of anadromous fish is to be minimized to the maximum extent practicable, and the retention of anadromous fish taken incidentally during fishing activity directed at non-anadromous fish is prohibited, and any such anadromous fish shall be returned immediately to the sea. The area to which the Convention applies is the waters of the North Pacific Ocean and its adjacent seas, north of 33º North Latitude beyond the 200-mile zones of the costal States. The activities under this Convention, for scientific purposes, may extend farther southward in the North Pacific Ocean and its adjacent seas in areas beyond the 200 zones.

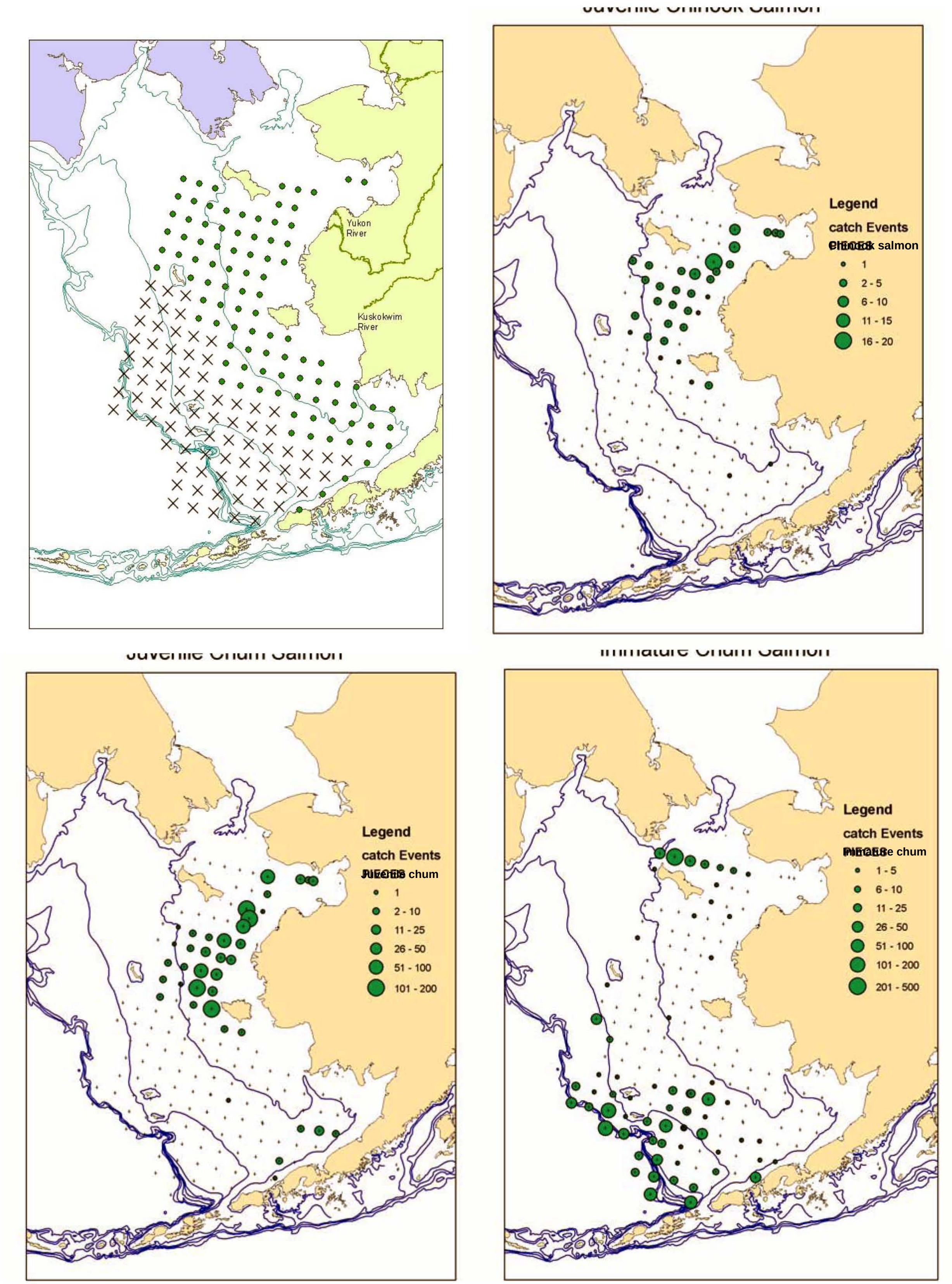


Figure 16.–U.S. BASIS sampling stations, juvenile Chinook salmon catches, juvenile chum salmon catches, and immature chum salmon catches in 2006.

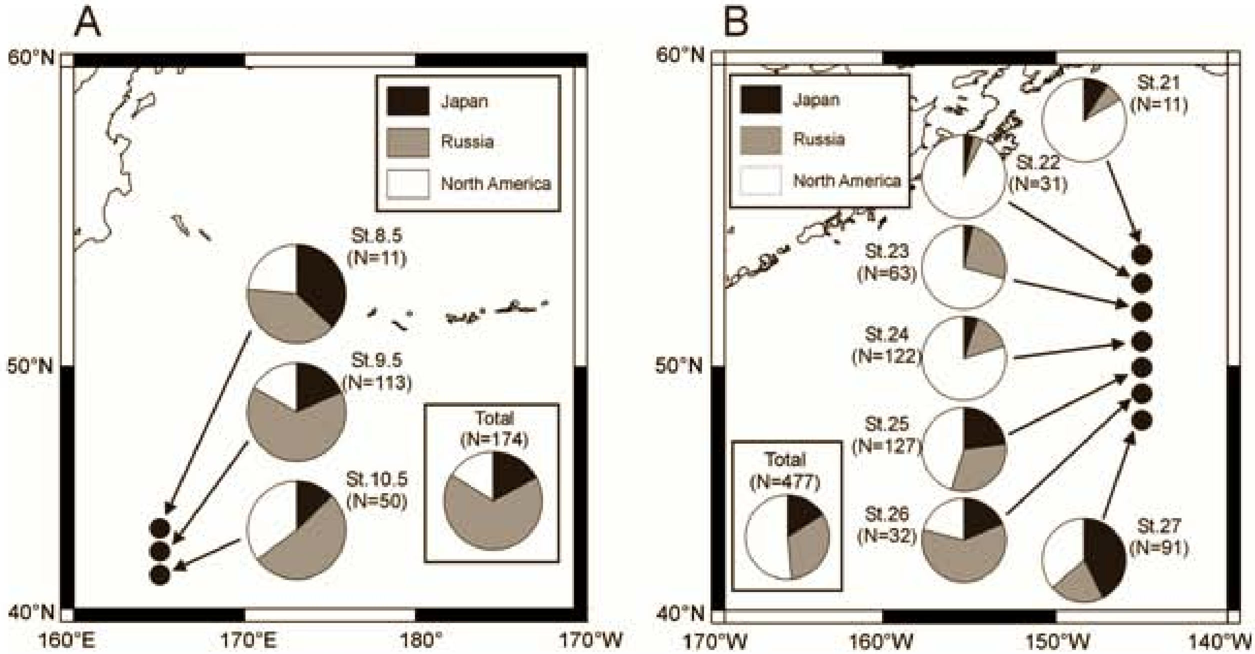


Figure 17.–(A) Stock composition of ocean age-1 chum salmon mixture caught in the western North Pacific Ocean. (B) Stock composition of ocean age-2–5 chum salmon mixtures caught in the Gulf of Alaska. The stock composition was estimated by mtDNA analysis.

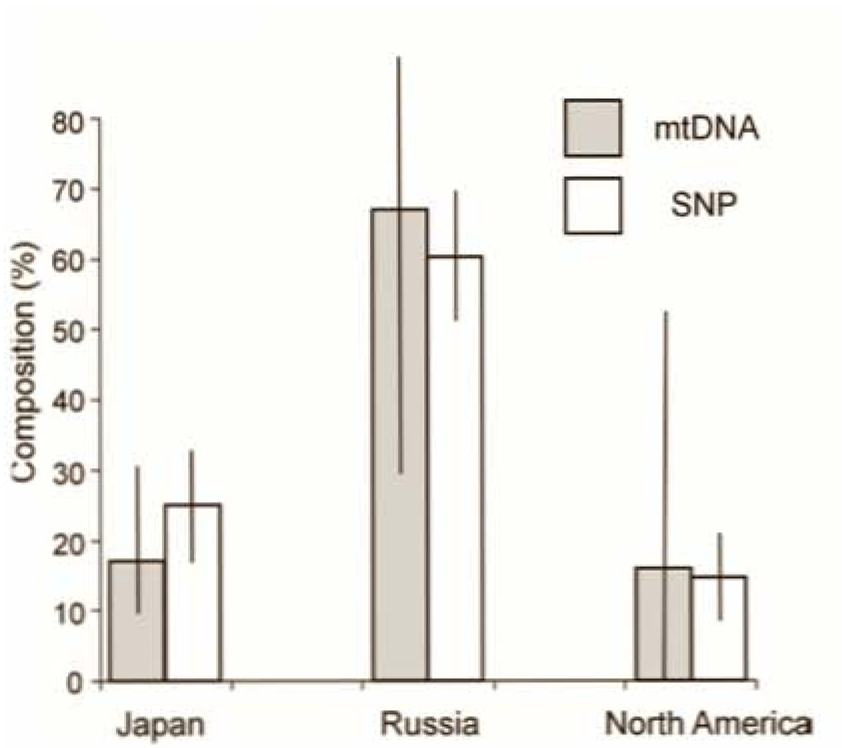


Figure 18.–Comparison of stock composition estimates of young chum salmon (ocean age-1) caught in the western North Pacific Ocean during winter 2006 using mtDNA and SNP markers. Line bars indicate 90% confidence of estimates.

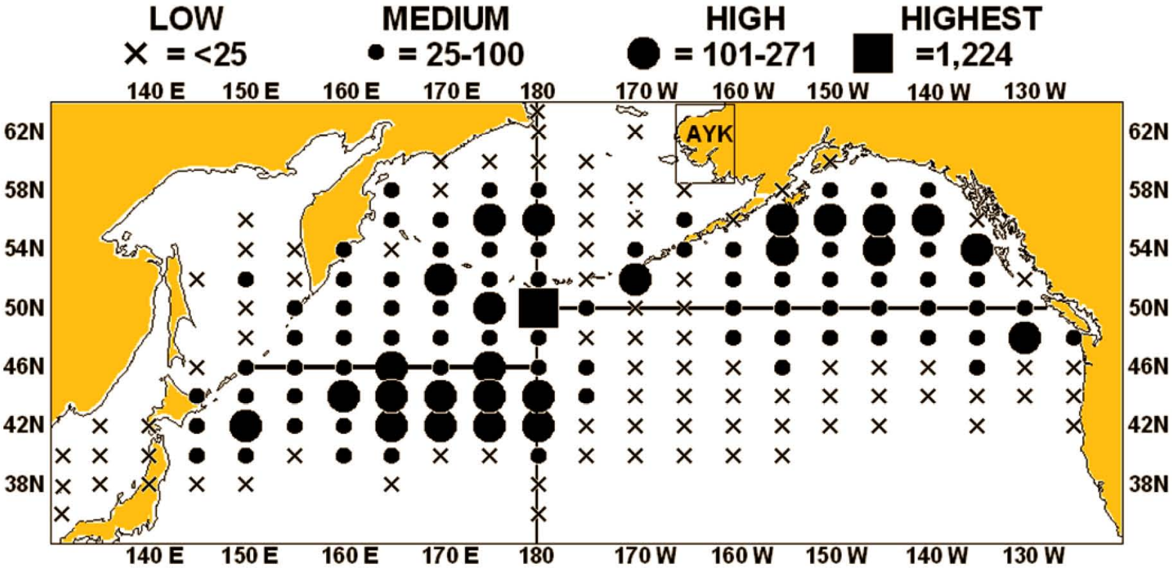


Figure 19.–Spatial distribution of high seas salmon tagging operations (number of operations in 2° latitude by x 5° longitude area strata), 1954–2005.

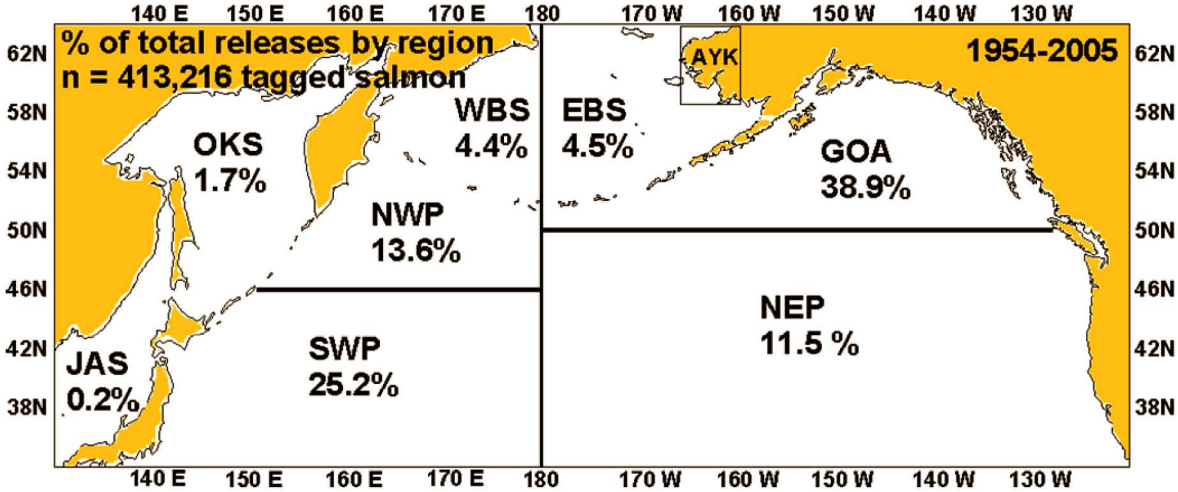


Figure 20.–Distribution of releases of tagged fish (% of total releases) by region, 1954–2005. WBS = Western Bering Sea, EBS = Eastern Bering Sea, GOA = Gulf of Alaska, NEP = Northeast Pacific, NWP = Western Pacific (north of 46°N), SWP = Western North Pacific (south of 46°N), JAS = Japan Sea, OKS = Okhotsk Sea.

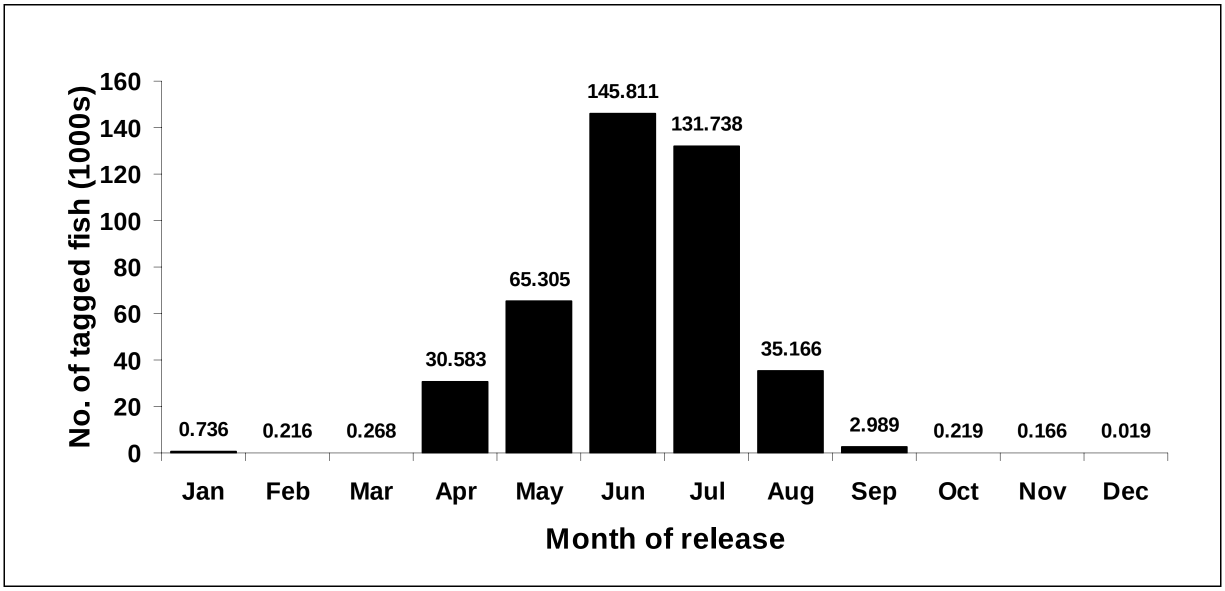


Figure 21.–Number of releases of tagged salmon (1,000s of fish) by month, 1954–2005.

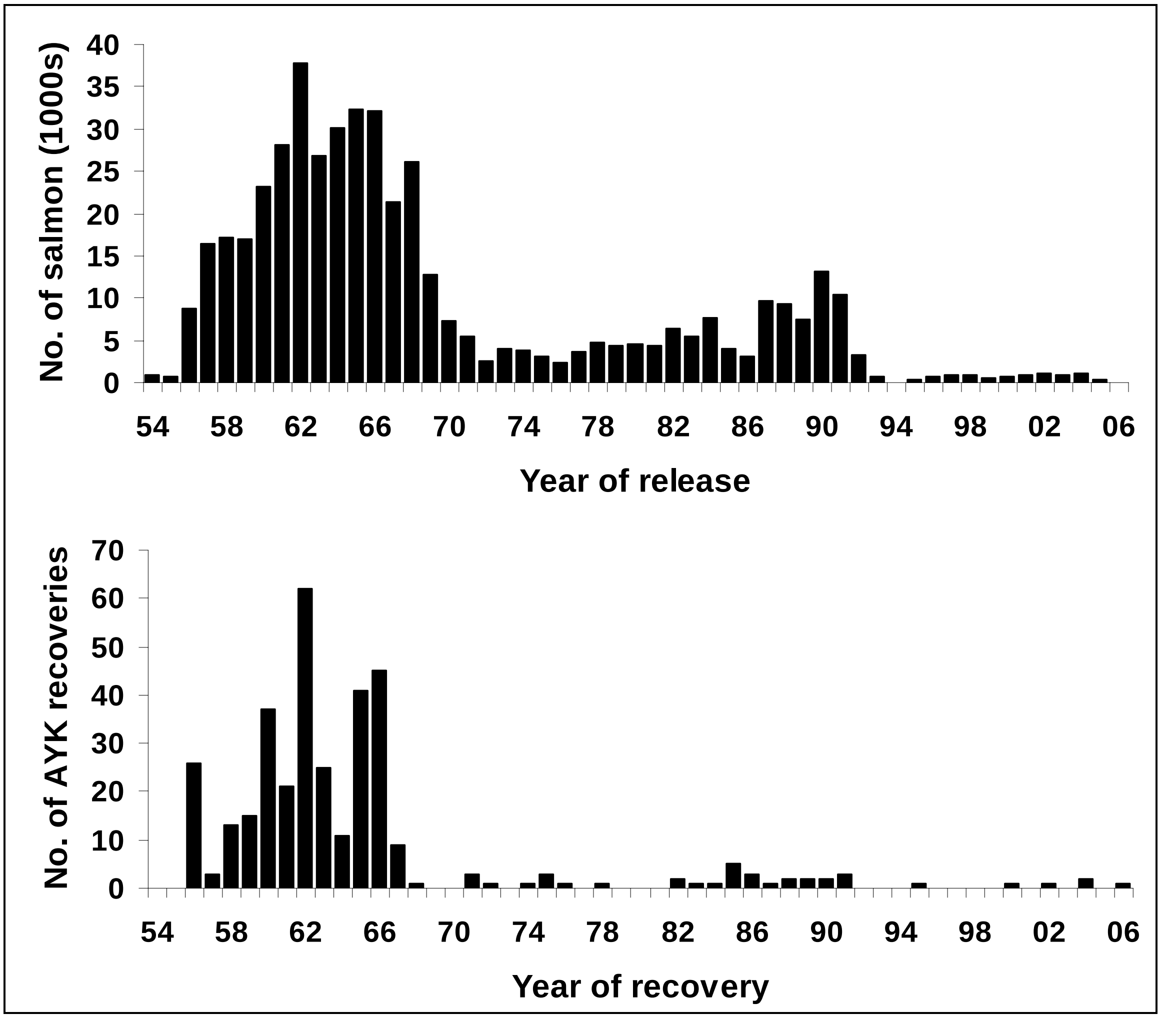


Figure 22.–Number of salmon released (top) during high seas tagging experiments, 1954–2005 (total = 413,216 fish); number of reported tagged salmon recoveries (bottom) in the AYK region (Norton Sound, Yukon, Kuskokwim), 1956–2006 (total = 347 fish).

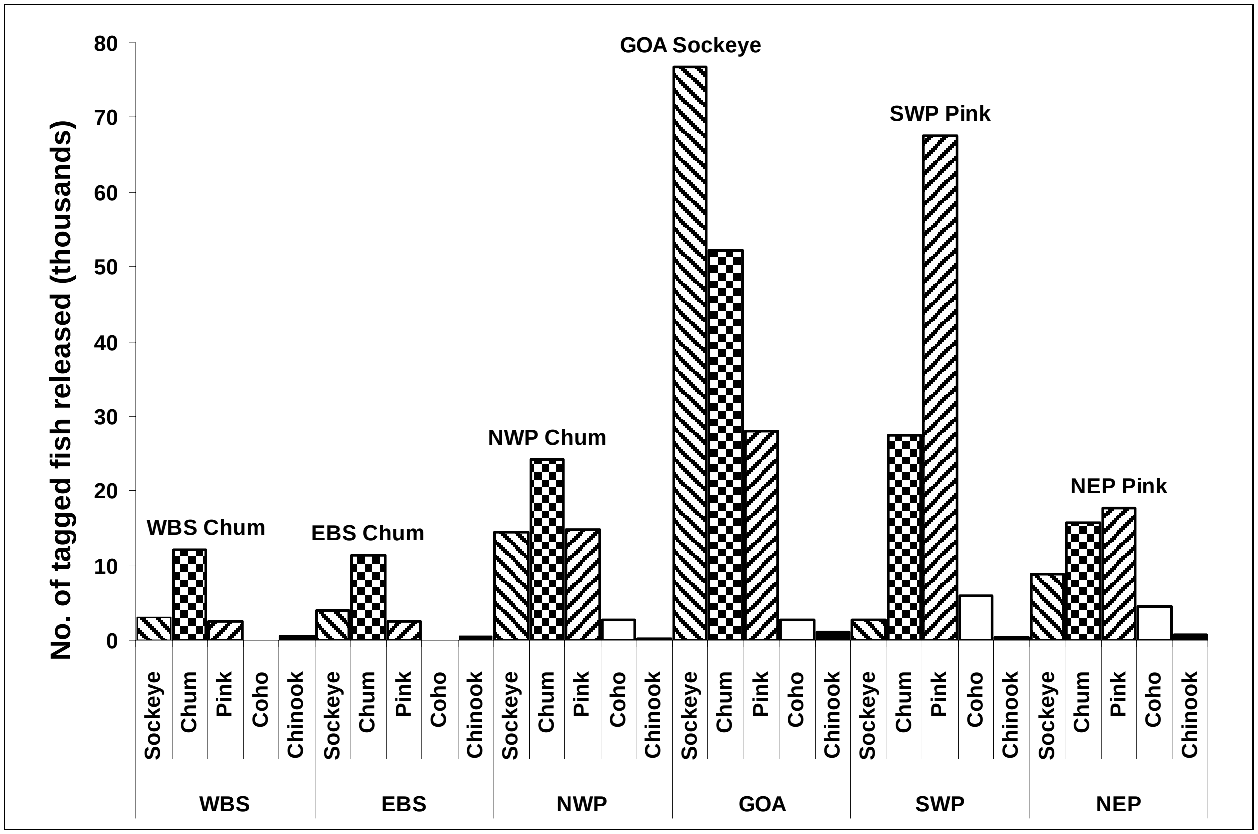


Figure 23.–Number of tagged fish released by species and ocean region, 1954–2005. WBS = Western Bering Sea, EBS = Eastern Bering Sea, GOA = Gulf of Alaska, NEP = Northeast Pacific, NWP = Western Pacific (north of 46°N), SWP = Western North Pacific (south of 46°N).

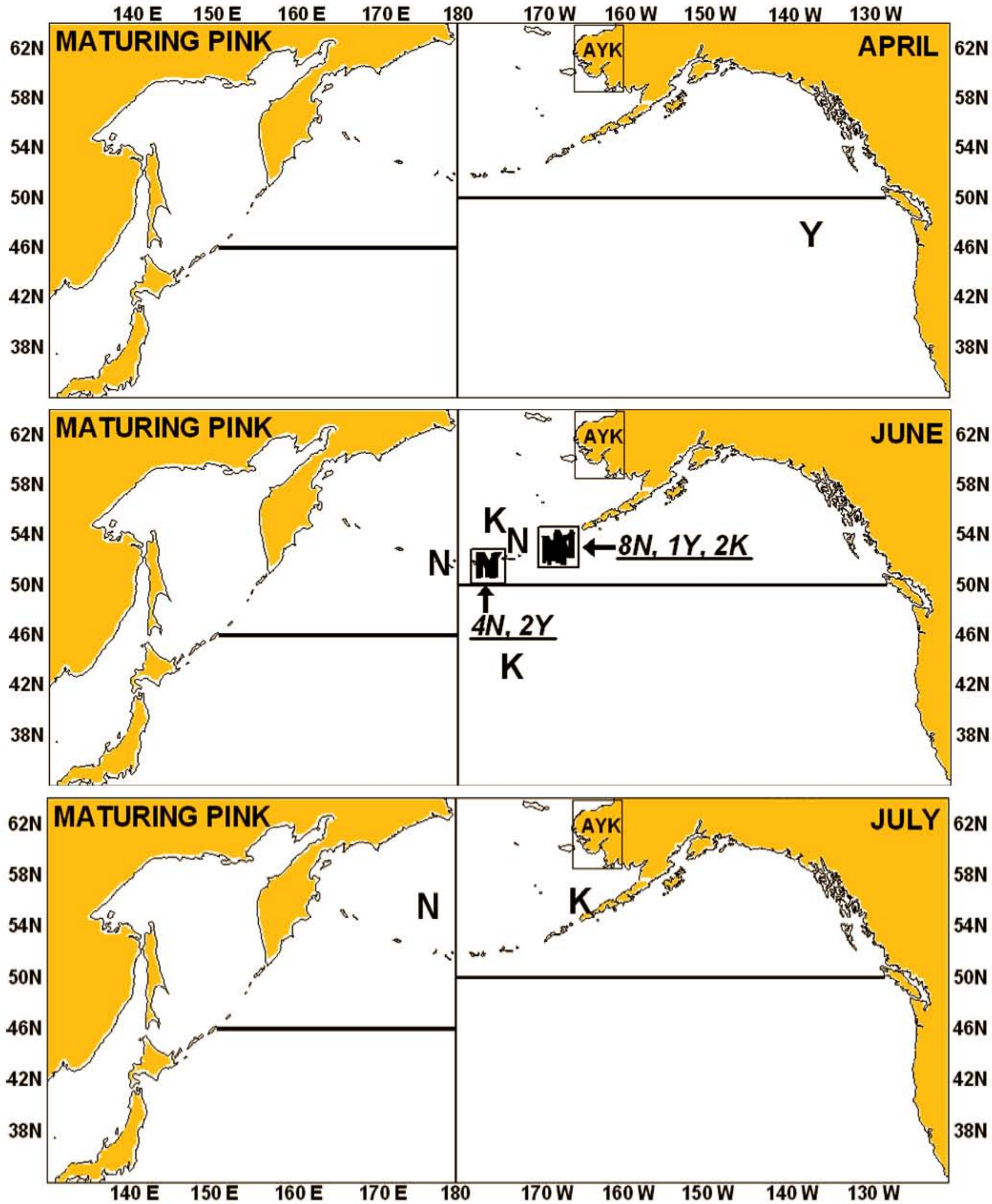


Figure 24.–The known ocean distribution of maturing AYK pink salmon by month, as indicated by high seas tag experiments, 1954–2006. The letters indicate high seas release location and stock of origin: N=Norton Sound, Y=Yukon and K=Kuskokwim. All fish were age 0.1 at release. In June (middle), labeled arrows point to multiple recoveries and show number of recoveries (underlined and italic) per stock. Number of recoveries by month of release: April=1 fish, June=21, July=2. Reported dates of recovery of adult fish in the AYK region ranged from July 18 to August 6.

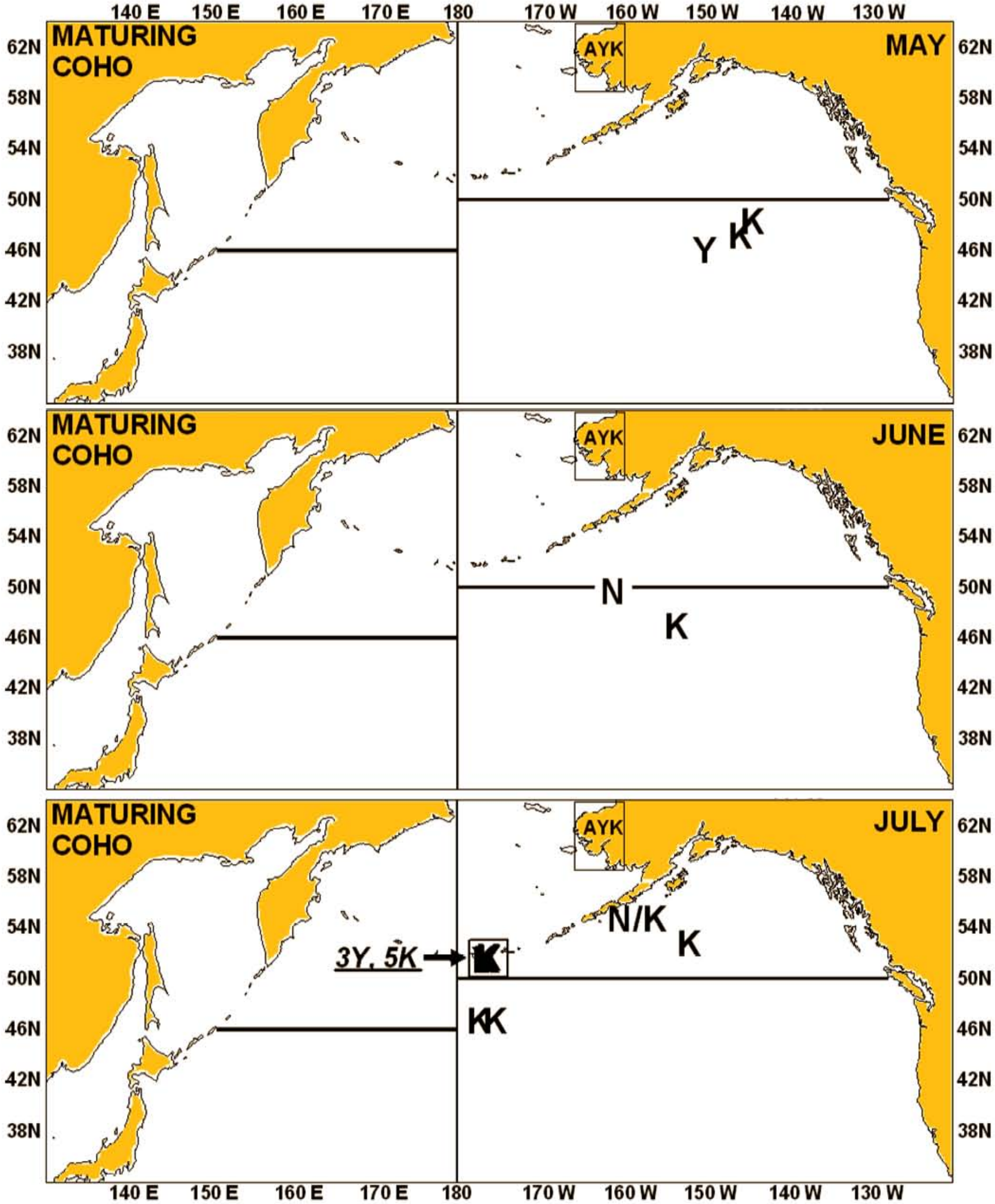


Figure 25.–The known ocean distribution of maturing AYK coho salmon by month, as indicated by high seas tag experiments, 1954–2006. The letters indicate high seas release location and stock of origin: N=Norton Sound, Y=Yukon and K=Kuskokwim. All fish were ocean age-1 at release. In July (bottom), labeled arrow points to multiple recoveries and shows number of recoveries (underlined and italic) per stock. Forward slash between numbers or letters indicates data for two fish released at the same location. Number of recoveries by month of release: May=3 fish, June=2, July=13. Reported dates of recovery of adult fish in the AYK region ranged from August 10 to September 28.

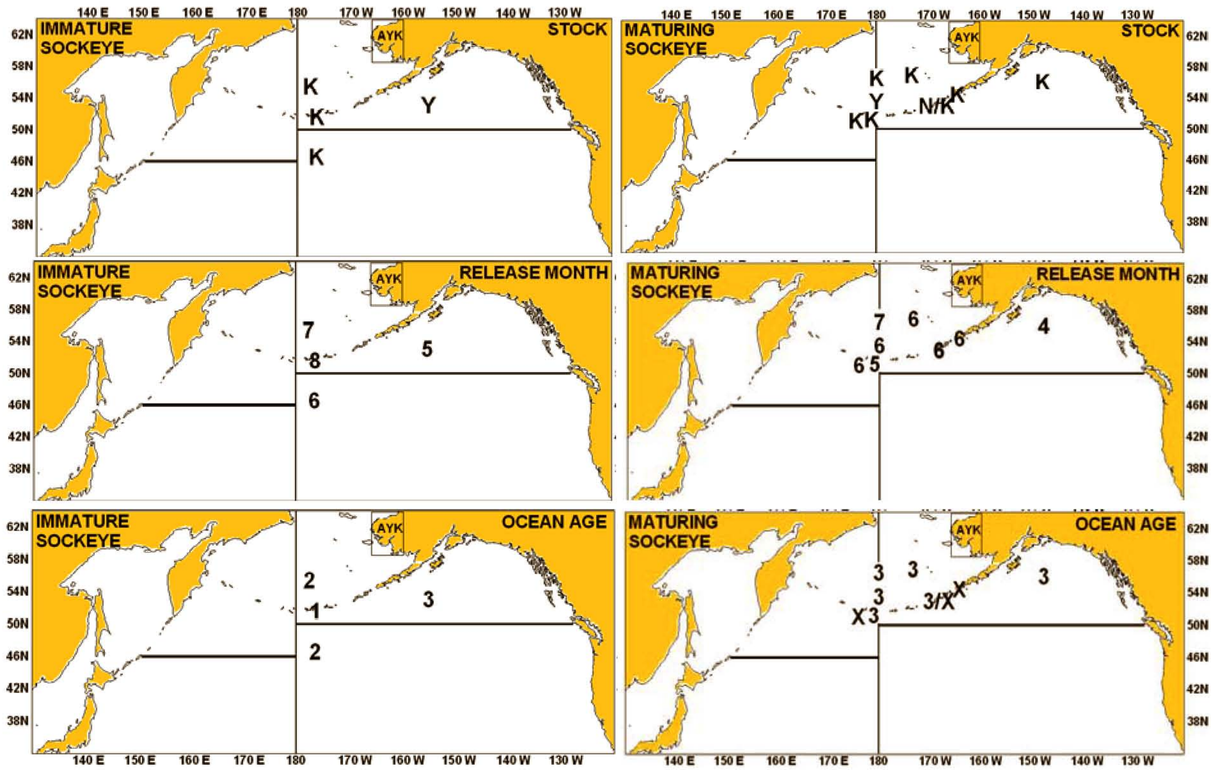


Figure 26.–The known ocean distribution of immature (left) (4 fish) and maturing (right) (9 fish) Yukon (Y) and Kuskokwim (K) sockeye salmon by stock (top), month of release (center), and ocean age group at release (bottom) (X=ocean age unknown), as indicated by high seas tag experiments, 1954–2006. All fish were ocean age-1 at release. Forward slash between numbers or letters indicates data for two fish released at the same location. Reported dates of recovery of adult fish in the AYK region ranged from June 17 to September 8.

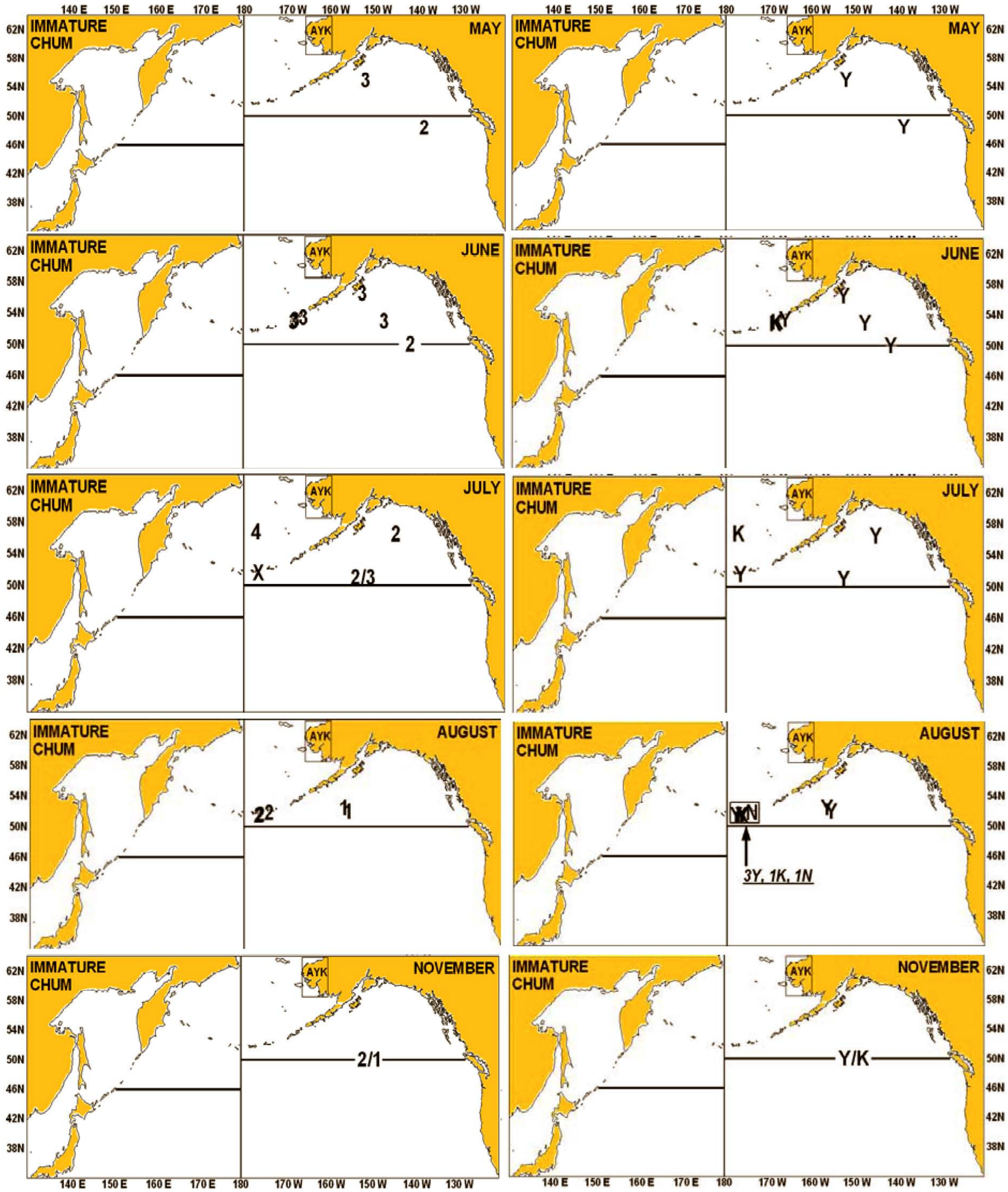


Figure 27.–The known ocean distribution of immature Norton Sound (N), Yukon (Y), and Kuskokwim (K) chum salmon by month, ocean age group (left), and stock (right), as indicated by high seas tag experiments 1954–2006. Numbers in left panels are ocean age at release (X=ocean age unknown). A forward slash between two numbers indicates recoveries from two age groups released at or near the same ocean location. In August (right), labeled arrow points to multiple recoveries and shows number of recoveries (underlined and italic) per stock. Number of recoveries by month of release: May=2 fish, June=6, July=5, August=7, November=2. Reported dates of recovery of adult fish in the AYK region ranged from June 16 to September 24.

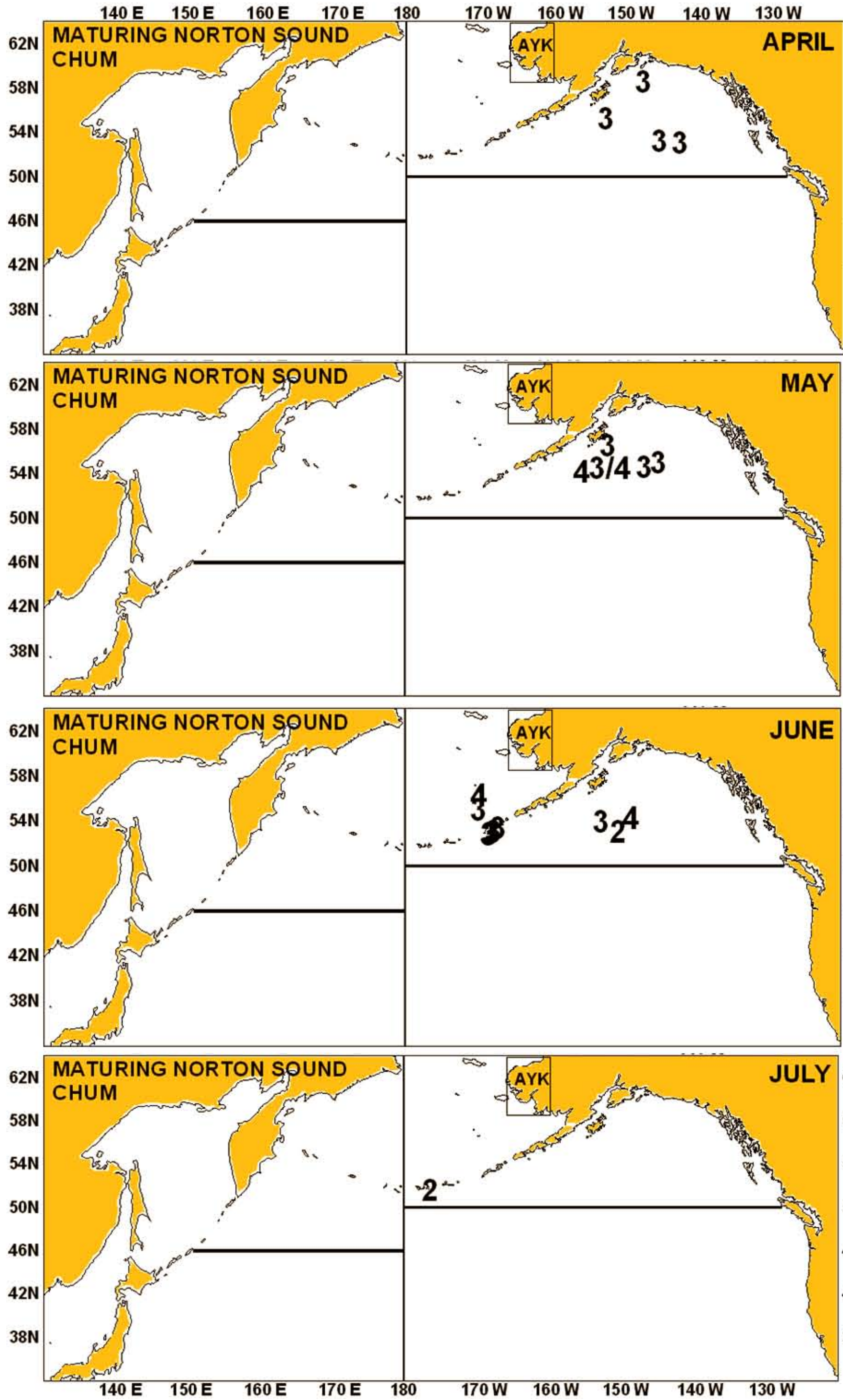


Figure 28.–The known ocean distribution of maturing Norton Sound chum salmon by ocean age group and month, as indicated by high seas tag experiments, 1954–2006. Numbers indicate the high seas location and ocean age at release (X=ocean age unknown). A forward slash between numbers indicates data for two fish released at the same ocean location. Number of recoveries by month of release: April=4 fish, May=6, June=13, July=1. Reported dates of recovery of adult fish in the AYK region ranged from June 29 to August 22.

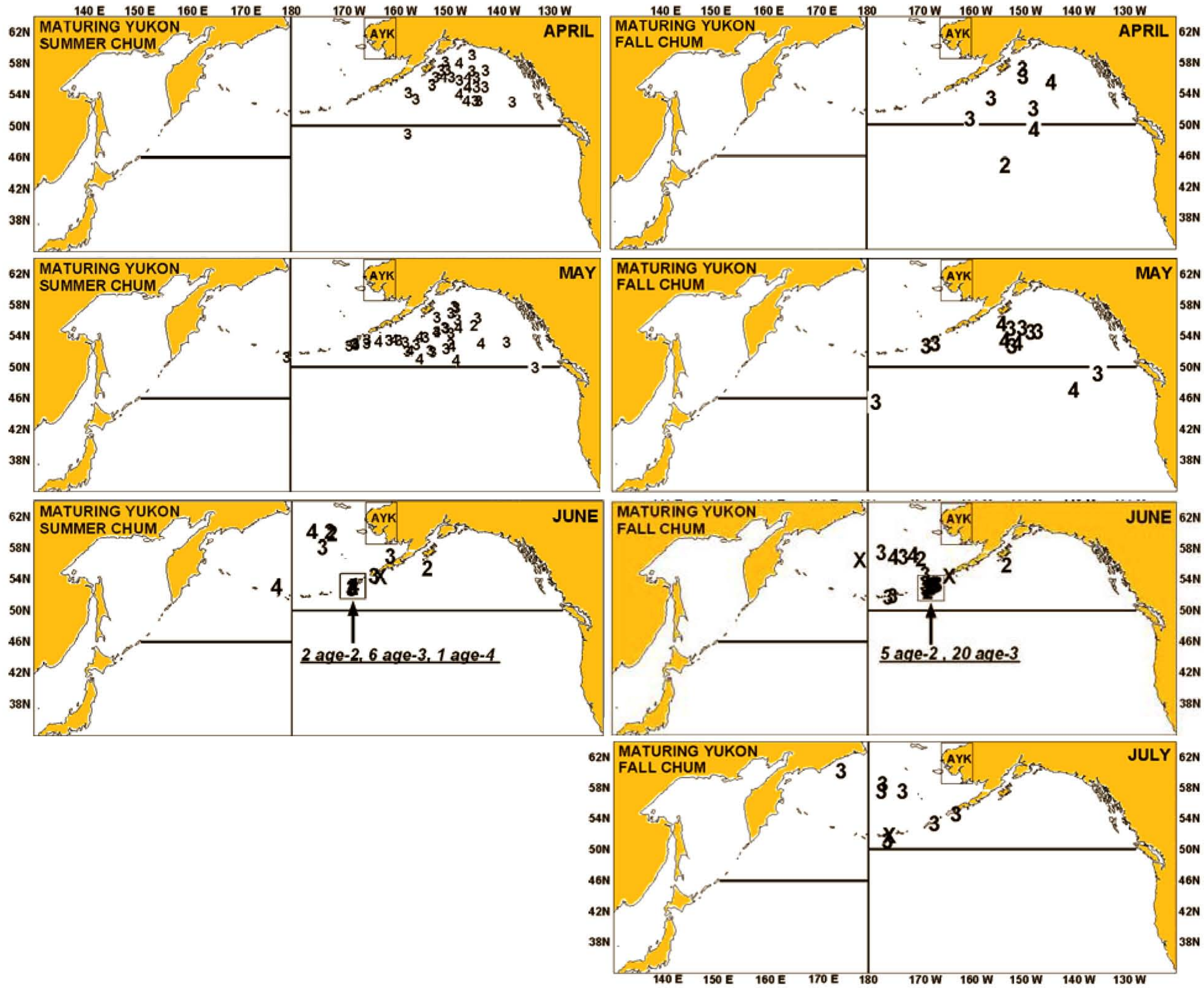


Figure 29.–The known ocean distribution of maturing Yukon River summer (left) and fall (right) chum salmon by ocean age group and month, as indicated by high seas tag experiments 1954–2006. Numbers indicate the high seas location and ocean age at release (X=ocean age unknown). Multiple recoveries from a single age group of fish released at the same ocean location are not indicated. In June, labeled arrows point to multiple recoveries and show number of recoveries (underlined and italic) by age group. Number of recoveries by month of release for summer chum: April=32 fish, May=50 fish, June=18. Number of recoveries by month of release for fall chum: April=8 fish, May=13, June=36, July=8. Seasonal race was determined by the reported date of recovery of adult fish in the AYK region; summer chum recovery dates ranged from June 5 to July 14; fall chum recovery dates ranged from July 15 to October 1.

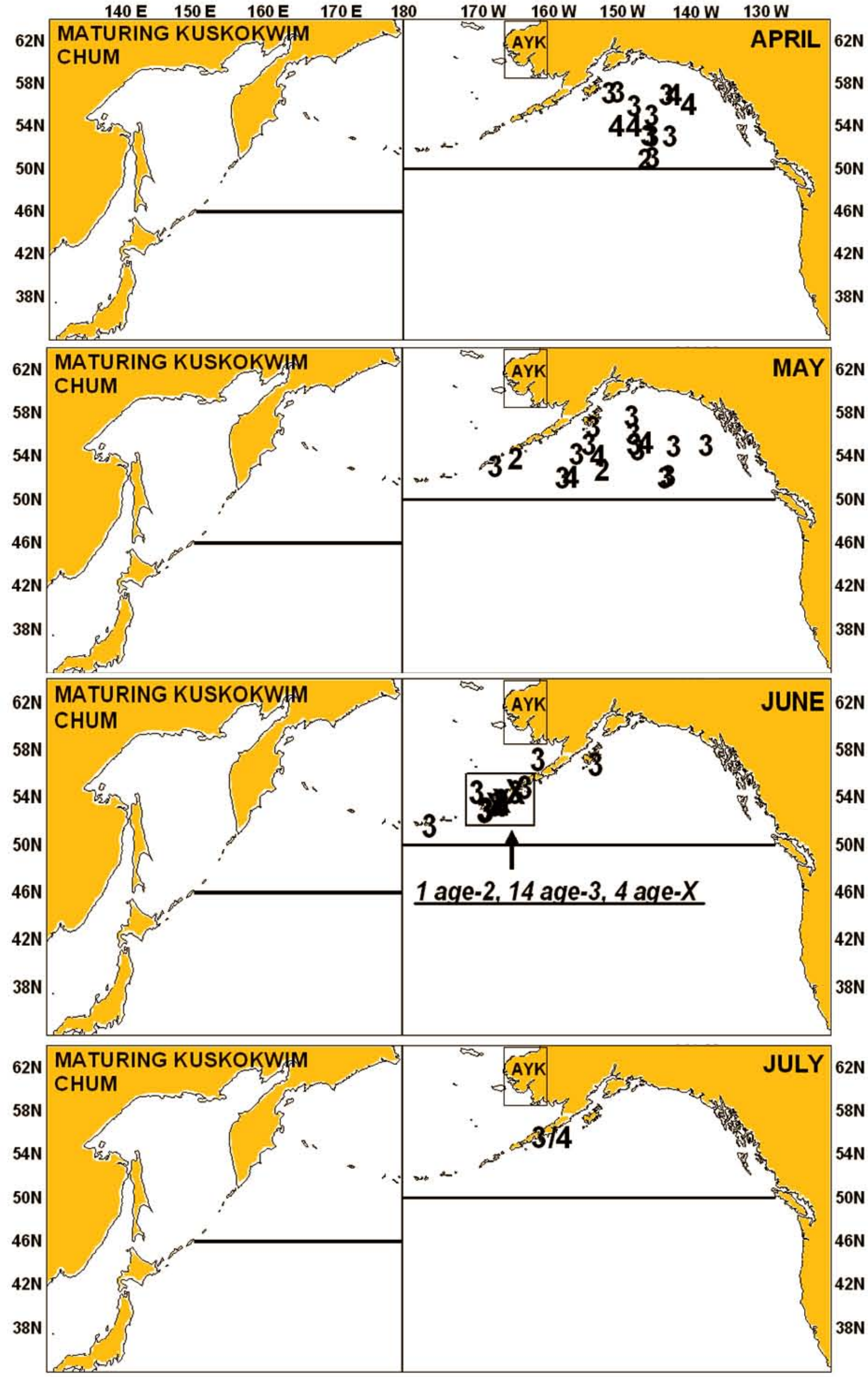


Figure 30.–The known ocean distribution of maturing Kuskokwim River chum salmon by ocean age group and month, as indicated by high seas tag experiments, 1954–2006. Numbers indicate the high seas location and ocean age at release (X=ocean age unknown). In June, labeled arrow points to multiple recoveries and shows number of recoveries (underlined and italic) per age group. Forward slash between numbers indicates data for two fish released at the same ocean location. Number of recoveries by month of release: April=14 fish, May=19, June=24, July=2. Reported dates of recovery of adult fish in the AYK region ranged from June 8 to August 12.

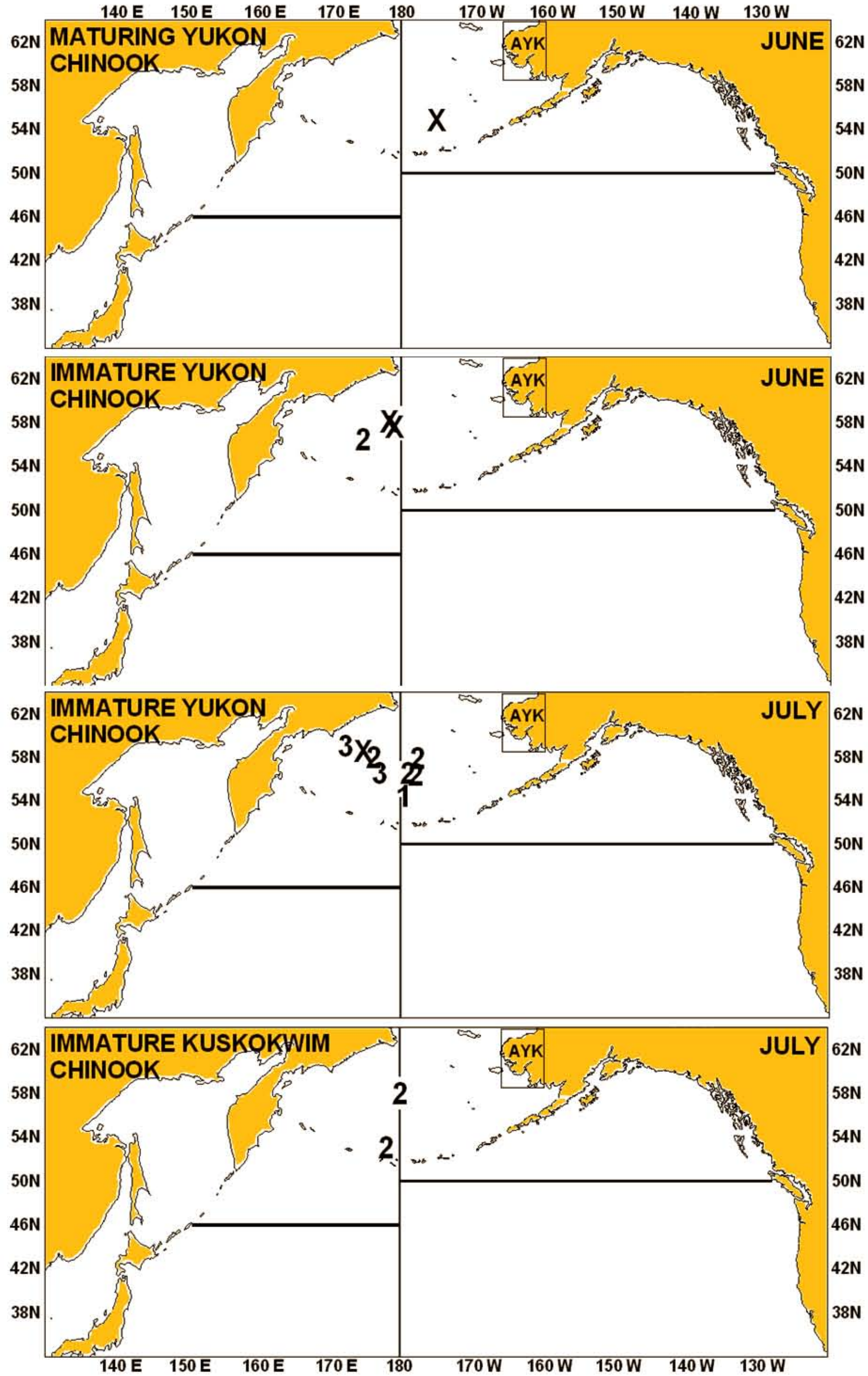


Figure 31.–The known ocean distribution of maturing (top) and immature Yukon and Kuskokwim Chinook salmon by month, as indicated by high seas tag experiments, 1954–2006. Numbers indicate the high seas location and ocean age at release (X=ocean age unknown). Number of recoveries by month of release: June=4 (1 maturing and 3 immature Yukon fish), July=10 immature fish (8 Yukon, 2 Kuskokwim). Reported dates of recovery of adult fish in the AYK region ranged from June 2 to July 24.

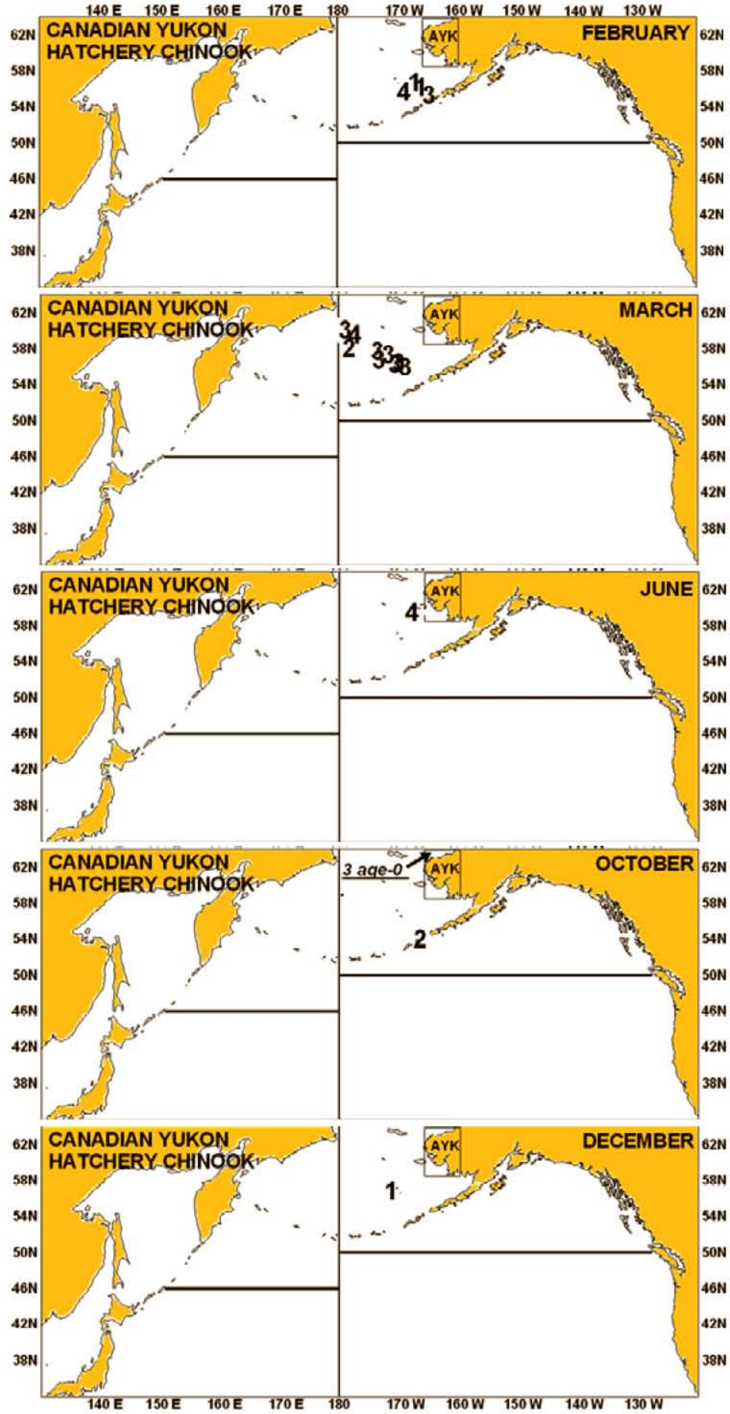


Figure 32.–The known ocean distribution of Canadian Yukon hatchery Chinook salmon by month, as determined by marine recoveries of coded wire tagged fish, 1992–2006. Numbers indicate the location and ocean age at recovery. In October, labeled arrow points to the AYK region and indicates 3 juveniles (brood year 2001; age 0.0) released from Whitehorse Rapids Fish Hatchery in June 2002 and recovered in Norton Sound in October 2002. Number of ocean recoveries by month: February=4 fish, March=9, June=1, October=4, and December=1.

APPENDIX A: TABLES

Appendix Table A1.–Alaskan commercial salmon sales and estimated harvest by district 2006.

		Chinook			Summer Chum			Fall Chum			Coho		
District/ Subdistrict	**Number of Fishermen[a]**	**Sold in Round**	**Pounds of Roe**	**Estimated Harvest[b]**	**Sold in Round**	**Pounds of Roe**	**Estimated Harvest[b]**	**Sold in Round**	**Pounds of Roe**	**Estimated Harvest[b]**	**Sold in Round**	**Pounds of Roe**	**Estimated Harvest[b]**
1	408	23,748	0	23,748	21,816	0	21,816	101,254	0	101,254	39,323	0	39,323
2	224	19,843	0	19,843	25,543	0	25,543	39,905	0	39,905	14,482	0	14,482
Subtotal	583	43,591	0	43,591	47,359	0	47,359	141,159	0	141,159	53,805	0	53,805
3	6	315	0	315	116	0	116	0	0	0	0	0	0
Total Lower Yukon	586	43,906	0	43,906	47,475	0	47,475	141,159	0	141,159	53,805	0	53,805
Anvik River	0	0	0	0	0	0	0	0	0	0	0	0	0
4-A	0	0	0	0	0	0	0	0	0	0	0	0	0
4-BC	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal District 4[c]	0	0	0	0	0	0	0	0	0	0	0	0	0
5-ABC	20	1,839	0	1,839	20	0	20	10,030	0	10,030	0	0	0
5-D	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal District 5	20	1,839	0	1,839	20	0	20	10,030	0	10,030	0	0	0
6	16	84	0	84	44,621	0	44,621	23,353	0	23,353	11,137	0	11,137
Total Upper Yukon	36	1,923	0	1,923	44,641	0	44,641	33,383	0	33,383	11,137	0	11,137
Total Alaska	**622**	**45,829**	**0**	**45,829**	**92,116**	**0**	**92,116**	**174,542**	**0**	**174,542**	**64,942**	**0**	**64,942**

Note: See Appendix Tables B1–B5 and B8. See Appendix Figures B1–B5 and B8. Does not include ADF&G test fishery sales.

[a] Number of unique permits fished by district, subdistrict or area. Totals by area may not add up due to transfers between districts or subdistricts.

[b] Unless otherwise noted, estimated harvest is the number of fish sold in the round plus the estimated number of females harvested to produce roe sold (pounds of roe sold divided by weighted average roe weight per female).

[c] Estimated harvest includes both males and females harvested to produce roe sold (pounds of roe sold divided by weighted average roe weight per female divided by average percent females in the harvest). Summer chum salmon sold in the round in District 4 are assumed to be males and are included in the estimated harvest calculation.

Appendix Table A2.–Pilot Station sonar project estimates, Yukon River drainage, 1995, 1997–2006.

	2006			2005 [a]	2004	2003	2002	2001[b]	2000	1999	1998	1997 [c]	1995
Species	Passage Estimate	lower 90% Confidence Interval	upper 90% Confidence Interval	Passage Estimates									
Large Chinook [d]	145,553	124,405	166,701	142,007	110,236	245,037	92,584	85,511	39,233	127,809	71,177	118,121	130,271
Small Chinook	23,850	18,370	29,330	17,434	46,370	23,500	30,629	13,892	5,195	16,914	16,675	77,526	32,674
Chinook Total	169,403	147,557	191,249	159,441	156,606	268,537	123,213	99,403	44,428	144,723	87,852	195,647	162,945
Summer Chum	3,767,044	3,607,810	3,926,278	2,439,616	1,357,826	1,168,518	1,088,463	441,450	456,271	973,708	826,385	1,415,641	3,556,445
Fall Chum [e]	790,563	727,848	853,278	1,813,589	594,060	889,778	326,858	376,182	247,935	379,493	372,927	506,621	1,053,245
Chum Total	4,557,607	4,386,467	4,728,747	4,253,205	1,951,886	2,058,296	1,415,321	817,632	704,206	1,353,201	1,199,312	1,922,262	4,609,690
Coho [e]	131,919	112,381	151,457	184,718	188,350	269,081	122,566	137,769	175,421	62,521	136,906	104,343	101,806
Pink	115,624	98,206	133,042	37,932	243,375	4,656	64,891	665	35,501	1,801	66,751	2,379	24,604
Other Species [f]	875,899	783,367	968,431	593,248	637,257	502,878	557,779	353,431	361,222	465,515	277,566	621,857	1,011,855
Season Total	5,850,452			5,228,544	3,177,474	3,103,448	2,283,770	1,408,900	1,320,778	2,027,761	1,768,387	2,846,488	5,910,900

Note: Estimates for all years were generated with the most current apportionment model and may differ from earlier estimates.

[a] Estimates include extrapolations for the dates June 10 to June 18 to account for the time before the DIDSON was deployed.

[b] Record high water levels experienced at Pilot Station in 2001, and therefore passage estimates are considered conservative.

[c] The Yukon River sonar project did not operate at full capacity in 1996 and therefore there are no passage estimates.

[d] Chinook salmon >655 mm.

[e] This estimate may not include the entire run.

[f] Includes sockeye salmon, cisco, whitefish, sheefish, burbot, suckers, Dolly Varden, and northern pike.

Appendix Table A3.–The Yukon River drainage summer chum salmon management plan overview, 2006.

	Required Management Actions Summer Chum Salmon Directed Fisheries			
Projected Run Size [a]	Commercial	Personal Use	Sport	Subsistence
600,000 or Less	Closure	Closure	Closure	Closure [b]
600,000 to 700,000	Closure	Closure	Closure	Possible Restrictions [c]
700,001 to 1,000,000	Restrictions [d]	Restrictions [e]	Restrictions [e]	Normal Fishing Schedules
Greater Than 1,000,000	Open [f]	Open	Open	Normal Fishing Schedules

[a] The department will use best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects to assess the run size.

[b] The department may, by emergency order, open subsistence summer chum salmon directed fisheries where indicators show that the escapement goal(s) in that area will be achieved.

[c] The department shall manage the fishery to achieve drainage wide escapement of no less than 600,000 summer chum salmon, except that the department may, by emergency order, open a less restrictive directed subsistence summer chum fishery in areas where indicator(s) show that the escapement goal(s) in that area will be achieved.

[d] The department may, by emergency order, open commercial fishing in areas that show the escapement goal(s) in that area will be achieved.

[e] The department may, by emergency order, open personal use and sport fishing in areas where indicator(s) show the escapement goal(s) in that area will be achieved.

[f] The department may open a drainage-wide commercial fishery with the harvestable surplus distributed by district or subdistrict in proportion to the guideline harvest levels established in 5 AAC 05.362. (f) and (g).

Appendix Table A4.–The Yukon River drainage fall chum salmon management plan, 5 AAC 01.249, 2006.

Run Size Estimate [b] (Point Estimate)	Recommended Management Action [a] Fall Chum Salmon Directed Fisheries: Commercial	Personal Use	Sport	Subsistence	Targeted Drainagewide Escapement
300,000 or Less	Closure	Closure	Closure	Closure [c]	300,000 to 600,000
300,001 to 500,000	Closure	Closure [c]	Closure [c]	Possible Restrictions [c&d]	
500,001 to 600,000	Restrictions [c]	Open	Open	Pre-2001 Fishing Schedules	
Greater Than 600,000	Open [e]	Open	Open	Pre-2001 Fishing Schedules	

[a] Considerations for the Toklat River and Canadian mainstem rebuilding plans may require more restrictive management actions.

[b] The department will use the best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects.

[c] The fisheries may be opened or less restrictive in areas where indicator(s) suggest the escapement goal(s) in that area will be achieved.

[d] Subsistence fishing will be managed to achieve a minimum drainage-wide escapement goal of 300,000.

[e] Drainage-wide commercial fisheries may be open and the harvestable surplus above 600,000 will be distributed by district or subdistrict (in proportion to the guidelines harvest levels established in 5 AAC 05.365 and 5 AAC 05.367).

Appendix Table A5.–Canadian weekly commercial catches of Chinook, fall chum and coho salmon in the Yukon River in 2006.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number Fishing	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
28	15-Jul	14-Jul	18-Jul	4	8	31	562	0	0
29	22-Jul	21-Jul	24-Jul	3	8	23	720	0	0
30	29-Jul	28-Jul	30-Jul	2	10	19	427	3	0
31	05-Aug	04-Aug	07-Aug	3	7	20	516	17	0
32	12-Aug	--	--	0	0	0	0	0	0
33	19-Aug	--	--	0	0	0	0	0	0
34	26-Aug	--	--	0	0	0	0	0	0
35	02-Sep	--	--	0	0	0	0	0	0
36	09-Sep	03-Sep	07-Sep	4	2	6	2	173	0
37	16-Sep	10-Sep	14-Sep	4	1	4	2	505	0
38	23-Sep	17-Sep	22-Sep	5	2	10	0	2,782	1
39	30-Sep	24-Sep	29-Sep	5	0	2	0	265	0
40	07-Oct	01-Oct	08-Oct	7	1	7	0	351	0
41	14-Oct	08-Oct	15-Oct	7	0	0	0	0	0
Dawson Area Subtotal				0	0	0	2,229	4,096	1
Upriver Commercial Subtotal				0	0	0	103	0	0
TOTAL COMMERCIAL HARVEST				0	0	0	2,332	4,096	1
Chinook Test Fishery and Chum Live Release Test							0	0	0
Domestic Harvest							63	0	0
Estimated Recreational Harvest							606	0	0
Aboriginal Fishery Catch							5,757	2,521	0
TOTAL UPPER YUKON HARVEST							8,758	6,617	1
Old Crow Aboriginal Fishery							314	5,179	111
Old Crow Test Fishery (all fish were released)									

Appendix Table A6.–Salmon fishery projects conducted in the Alaskan portion of the Yukon River drainage in 2006.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch and associated effort of the Alaskan Yukon River commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon or salmon roe.	June - Sept.	ADF&G	all aspects
Commercial Catch Sampling and Monitoring	Alaskan portion of the Yukon River drainage	determine age, sex, and size of Chinook, chum and coho salmon harvested in Alaskan Yukon River commercial fisheries; monitor Alaskan commercial fishery openings and closures.	June - Sept.	ADF&G ADPS	all aspects enforcement
Subsistence and Personal Use Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch and associated effort of the Alaskan Yukon River subsistence salmon fishery via interviews, catch calendars, mail-out questionnaires, telephone interviews, and subsistence fishing permits, and of the personal use fishery based on fishery permits.	ongoing	ADF&G	all aspects
Sport Catch, Harvest and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch, harvest, and associated effort of the Alaskan Yukon River sport fishery via post-season mail-out questionnaires.	post season	ADF&G	all aspects
Yukon River Chinook Microsatellite Baseline	Yukon River drainage	Survey standardized microsatellites and Yukon River Chinook salmon populations.	ongoing	ADF&G DFO	US populations Canada populations
Yukon River Salmon Stock Identification	Yukon River drainage	estimate Chinook salmon stock composition of the various Yukon River drainage harvests through genetic stock identification, age compositions, and geographical distribution of catches and escapements.	ongoing	ADF&G	all aspects
Yukon River Chum and Chinook Mixed-Stock Analysis	Pilot Station, RM 123	estimate the stock compositions of Chinook and chum salmon using samples collected from Pilot Station sonar test fisheries	May-Aug	USFWS	all aspects
Yukon River Coho Salmon Population Structure	Yukon River drainage	assess the genetic diversity and population structure of Coho salmon using samples collected from 11 locations distributed throughout the Yukon River OSM 2005-2006	ongoing	USFWS	all aspects
YRDFA Weekly Teleconference	Yukon River drainage	acts as a forum for fishers along the Yukon River to interact with state and federal managers for the collection and dissemination of fisheries information	May - Sept.	YRDFA	all aspects
Lower Yukon River Set Gillnet Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	index Chinook salmon run timing and abundance using set gillnets. sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	all aspects
Lower Yukon River Drift Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets. sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Mountain Village Drift Gillnet Test Fishing	mainstem Yukon River, RM 87	index fall chum and coho salmon run timing and relative abundance using drift gillnets. sample captured salmon for age, sex, size composition information.	July - Sept.	Asa'carsarmiut Trad. Council	all aspects implementation with R & E
East Fork Weir, Andreafsky River	mile 20 East Fork RM 124	estimate daily escapement, with age, sex and size composition, of Chinook and summer chum salmon into the East Fork of the Andreafsky River.	June - Sept.	USFWS Yupiit of Andreafsky Algaaciq Tribal Council	all aspects partial funding from BSFA
Yukon River Sonar	Pilot Station, RM 123	estimate Chinook and summer and fall chum salmon passage in the mainstem Yukon River. Apportionment of species including coho salmon and other finfish.	June - Aug.	ADF&G AVCP	all aspects
Anvik River Sonar	mile 40 Anvik River, RM 358	estimate daily escapement of summer chum salmon to the Anvik River; estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	ADF&G	all aspects
Kaltag Creek Tower	mile 1 Kaltag Creek, RM 451	estimate daily escapement of Chinook and summer chum salmon into Kaltag Creek; estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	City of Kaltag ACES BSFA	all aspects provided funding provided funding R&E funding
Gisasa River Weir	mile 3 Gisasa River, Koyukuk River drainage, RM 567	estimate daily escapement of Chinook and summer chum salmon into the Gisasa River; estimate age, sex, and size composition of the Chinook and summer chum salmon escapements.	June - Aug.	USFWS	all aspects
Henshaw Creek Weir	mile 1 Henshaw Creek, RM 976	estimate daily escapement of Chinook and summer chum salmon into Henshaw Creek; estimate age, sex, and size composition of the Chinook and summer chum salmon escapements. OSM 2005-2007	June - Aug.	TCC BSFA USFWS-OSM	all aspects Federal Subsistence Funding oversite & funding
Chandalar River Sonar	mile 14 Chandalar River, RM 996	Feasibility to estimate Chinook salmon passage.	July	USFWS	all aspects
Chandalar River Sonar	mile 14 Chandalar River, RM 996	estimate fall chum salmon passage using split-beam sonar in the Chandalar River. investigate feasibility of using underwater video to document the presence of non-salmon fish species. Estimate sex and size composition of fall chum salmon escapement. Collected ASL data including vertebrae.	Aug. - Sept.	USFWS	all aspects
Sheenjek River Sonar	mile 6 Sheenjek River, Porcupine River drainage, RM 1,060	estimate daily escapement of fall chum salmon into the Sheenjek River using DIDSON sonar and counted both left and right banks. estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. - Sept.	ADF&G	all aspects
Eagle Sonar	Mainstem Yukon River Eagle, RM 1,213	estimate daily passage of Chinook and chum salmon in the mainstem Yukon River using both split-beam and DIDSON. estimate age, sex, and size composition of salmon captured in the test nets.	Jul.-Oct.	ADF&G DFO	all aspects technical support
Kaltag Village Drift Gillnet Test Fishing	Mainstem Yukon River Kaltag, RM 451	index fall chum and coho salmon run timing and relative abundance using drift gillnets. sample captured salmon for age, sex, size composition information.	July - Sept.	City of Kaltag	all aspects implementation with R & E

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Middle Yukon River Chinook Sampling Project	Mainstem Yukon River Kaltag, RM 451	estimate age, sex, and size composition of Chinook salmon harvested in middle Yukon River subsistence fisheries	June - July	City of Kaltag USFWS-OSM	all aspects implementation with R & E funding
Nenana River Escapement Surveys	Nenana River drainage, above RM 860	aerial and ground surveys for numbers and distribution of coho and chum salmon in ten tributaries of the Nenana below Healy Creek.	Sept. - Oct.	YRDFA ADF&G	all aspects database
Tanana Village South bank Yukon River Fish Wheel, Test Fishing	Mainstem Yukon River Tanana, RM 695	index the timing of Chinook, summer and fall chum, and coho salmon on the south bank of the Yukon River bound for the Tanana River drainage, using test fish wheel equipped with video monitoring systems.	Jun. - Aug.	ADF&G USFWS	all aspects R & E partial funding
Rapids Fish Wheel Test Fishing	Mainstem Yukon River RM 730	index run timing of Chinook and fall chum salmon runs as well as non-salmon species using video monitoring techniques.	June-Sept.	Zuray USFWS	all aspects implementation with R & E funding
Nenana Test Fish Wheel Test Fishing Tag Recovery	mainstem Tanana River Nenana, RM 860	index the timing of Chinook, summer chum, fall chum, and coho salmon runs using test fish wheels. Tag recovery fish wheel for fall chum salmon for Tanana Tagging mark-recapture project.	June - Sept.	ADF&G OSM	all aspects partial funding
Tanana Tagging Mark-recapture	mainstem Tanana River between RM 793 and 860.	estimate the population size of the Tanana River fall chum salmon run above the confluence of the Kantishna River using mark-recapture methodology;	Aug. - Sept.	ADF&G OSM	all aspects funding
Tozitna River Weir	Mile 50 Tozitna River Yukon River, RM 681	estimate daily escapement of Chinook and summer chum salmon into the Tozitna River, estimate age, sex and size comp of the Chinook and summer chum escapement	June-Aug.	BLM TTC	all aspects
Kantishna River Mark-recapture	Kantishna River RM 800	provides a mark-recapture abundance estimate for fall chum salmon within the Kantishna River drainage.	Aug - Oct.	ADF&G BSFA NPS OSM	all aspects funding for tagging fish wheel fund recovery fish wheels funding
Toklat River Tag Recovery	Toklat River Recovery RM 848	index run timing of fall chum and coho salmon using test fish wheels. recover tags from fall chum salmon for the Kantishna mark-recapture project.	Aug - Oct.	ADF&G	all aspects
Kantishna River Tag Recovery	Kantishna River RM 880	index run timing of fall chum and coho salmon using test fish wheels. recover tags from fall chum salmon for the Kantishna mark-recapture project.	Aug - Oct.	ADF&G NPS	all aspects funding for fish wheel contract
Toklat River Survey	Toklat River, between RM 848 and 853	sample fall chum salmon carcasses for age, sex, and size composition information. Aerial survey of spawning grounds.	mid-Oct.	ADF&G	all aspects
Delta River Ground Surveys	Tanana River drainage, RM 1,031	estimate fall chum spawning escapement in Delta River. recover tags from Upper Tanana mark-recapture program. Sample fall chum salmon carcasses for age, sex, and size composition information.	Oct.-Dec.	ADF&G	all aspects
Chena River Tower	Chena River, Tanana River drainage, RM 921	estimate daily escapement of Chinook and summer chum salmon into the Chena River.	July - Aug.	ADF&G	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Salcha River Tower	Salcha River, Tanana River drainage, RM 967	estimate daily escapement of Chinook and summer chum salmon into the Salcha River.	July - Aug.	BSFA	all aspects implementation with R & E
Goodpaster River Tower	Goodpaster River, Tanana River drainage, RM 1,049	estimate daily escapement of Chinook and summer chum salmon into the Goodpaster River.	July	TCC	all aspects funded by Pogo Mine
Upper Yukon River Chum Salmon Genetic Stock Identification	Yukon River drainage	establish the feasibility of using DNA marks for genetic stock identification of chum salmon in the Yukon River. OSM 2006-2008	June - Oct	USFWS	all aspects
Effects of *Ichthyophonus* on Survival and Reproductive Success	Emmonak, RM 20, Tanana River drainage, Chena River RM 902 and Salcha River RM 965	Determine the effects of *Ichthyophonus* on survival and reproductive success in Chinook salmon in the Yukon River. Final reports will complete project.	June-Dec.	ADF&G	all aspects, funding
Marshall Test Fish	Mainstem Yukon River RM 161	index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets. sample captured salmon for age, sex, size composition information.	June - July	AVCP	all aspects
Clear Creek Videography	Mile 1 Clear Creek Hogatza River drainage	estimate daily escapement of summer chum salmon into Clear Creek using video monitoring equipment. Estimate sex composition of summer chum escapement.	June - Aug.	BLM	all aspects
Yukon River Inseason Salmon Harvest Interviews	Emmonak, Holy Cross, Nulato, Huslia, Galena, and Beaver Primary	Collect qualitative inseason subsistence salmon harvest information through weekly interviews.	June-Sept	USFWS/YRDFA	all aspects OSM funding
Migratory Timing and Harvest Information of Chinook Salmon Stocks	Yukon River drainage	Enlarge existing allozyme and develop a DNA database to characterize the genetic diversity of Chinook salmon in the Yukon River within the U.S. and Canada. U.S. collections, microsatellites, allozyme. Can. Collections, microsatellites.	June-Aug.	USFWS, ADFG, DFO, USFWS-OSM	all aspects
Juvenile Chinook Rearing in non-natal streams	Yukon River downstream of the Canadian border	Capture juvenile Chinook salmon in non-natal Yukon River tributary streams; determine whether Canadian-origin juvenile Chinook salmon rear in Yukon River tributary streams of the United States using genetic techniques; and describe non-natal stream rearing habitat characteristics for Yukon River Chinook salmon.	July-August	USFWS	all aspects

Agency Acronyms:

ADF&G = Alaska Department of Fish and Game
ADPS = Alaska Department of Public Safety
AVCP = Association of Village Council Presidents, Inc.
BSFA = Bering Sea Fishermen's Association
BLM = Bureau of Land Management
DFO = Department of Fisheries and Oceans (Canada)
NPS = National Park Service
TCC = Tanana Chiefs Conference, Inc.
TTC = Tanana Tribal Council
USFWS = United States Fish and Wildlife Service
USFWS-OSM = United States Fish and Wildlife Service, Office of Subsistence Management
YRDFA = Yukon River Drainage Fisheries Association

Appendix Table A7.–List of harvest/escapement monitoring and incubation/rearing projects involving salmon in the Canadian portion of the Yukon River drainage in 2006.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Upper Yukon Tagging Program (mark-recapture)	Downstream of Dawson City	- to obtain population, and escapement estimates of Chinook and chum salmon in the Canadian section of the mainstem Yukon River - to collect stock ID, age, size, sex composition data - to participate in Eagle Sonar Program	June - Oct	DFO	all aspects
Chinook and Chum Test Fishery Fisheries	Near Dawson City	- to provide catch and tag recovery information for the mark recapture program as required (not required in 2006) - to provide ASL samples - the Chinook test fishey uses nets, while the chum test fishery uses live release fish wheels	July-Oct	YRCFA, THFN	all aspects
Commercial Catch Monitoring	Near Dawson City	- to determine weekly catches and effort in the Canadian commercial fishery (CM and CK); recovery of tags - to provide ASL information and DNA samples	July - Oct	DFO	all aspects
Aboriginal Catch Monitoring	Yukon communities	- to determine weekly catches and effort in the aboriginal fishery and recover tags - to implement components of the UFA and AFS	July - Oct	YFN's DFO	joint project
Recreational Catch Monitoring	Yukon R. mainstem and tributaries	- to detrmine the recretation harvest, landed and retained, of salmon caught in the Yukon through a catch card program	June-Oct	YSC/DFO	all aspects
DFO Escapement Index Surveys	Chinook and chum aerial index streams	- to obtain counts in index areas including: Big Salmon, L. Salmon Wolf, Nisutlin, Mainstem Yukon, Kluane & Teslin rivers	Aug - Nov	DFO	all aspects
Escapement Surveys and DNA Collection	Throughout upper Yukon R. drainage	- to conduct surveys of spawning fish by foot, boat and air etc. - to enumerate and recover tags in terminal areas - to collect DNA samples from spawning population and aggregate samples from fisheries and large migration corridors	July - Oct	various R&E Fund recipients, consultants YFN's AFS	all aspects
Fishing Branch Chum Salmon Weir	Fishing Branch R.	- to enumerate chum salmon returning to the Fishing Branch River and obtain age, size, tag and sex composition data	Aug - Oct	DFO VGG	joint project
Whitehorse Rapids Fishway	Whitehorse	- to enumerate wild and hatchery reared Chinook returns to the Whitehorse area and obtain age, size, sex and tag composition data	July - Aug	YFGA	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Blind Creek Weir	Pelly River	- to enumerate Chinook escapement and recover tags - to collect ASL data and DNA samples	July-Aug	JW&A RRDC	all aspects
Big Salmon Sonar	Big Salmon River	- installation and operation of a DIDSON sonar program for Chinook - carcass survey for tags, ASL, and DNA	July-Aug	JW&A M&A	all aspects
Escapement Sampling	various tributaries	- to collect ASL data and DNA samples	Aug -Oct	DFO	all aspects
Porcupine Mark-Recapture Program	Porcupine River	- to conduct chum marking and test fishery porgram - to establish method of conducting in-season local management	Aug -Oct	VGG & EDI	all aspects
Whitehorse Rapids Fish Hatchery and Coded-Wire Tagging Project	Whitehorse	- to rear and release ~150K Chinook fry from broodstock collected at the Whitehorse Rapids Fishway - to mark fry with CWT, adipose clip, and release upstream of Whitehorse hydroelectric facility	ongoing	RR, YEC YFGA, DFO	all aspects coded-wire tagging
MacIntyre Incubation Box and Coded-Wire Tagging Project	Whitehorse	- to rear up to 120K Chinook fry from broodstock collected from the Takhini River and/or Tatchun Creek - to mark fry with CWT, adipose clip, and release at natal sites	ongoing	DFO YC NRI	technical support field work, project monitoring

Acronyms:

AFS	= Aboriginal Fisheries Strategy
DFO	= Department of Fisheries and Oceans Canada
EDI	= Environmental Dynamics Incorporated
JW&A	= Jane Wilson & Associates
M&A	= Mercer and Associates Ltd.
NRI	= Northern Research Institute
RR	= Government of Yukon- Renewable Resources
THFN	= Tr'ondek Hwech'in First Nation
VGG	= Vuntut Gwitchin Government
YC	= Yukon College
YEC	= Yukon Energy Corporation
YFN's	= Yukon First Nation's
YFGA	= Yukon Fish and Game Association
YRCFA	= Yukon River Commercial Fishers Association
YSC	= Yukon Salmon Committee

Appendix Table A8.–Yukon River Canadian Chinook salmon total run by brood year, and escapement by year, 1982–1999 and Return per Spawner (R/S) (8-year-olds for Brood Year 1999 are projected).

Brood	Age Group by Brood Year								Return per
Year	3	4	5	6	7	8	Total Return	Escapement	Spawner
1974						596			
1975					27,199	162			
1976				75,458	19,698	30			
1977			15,436	100,941	16,171	593			
1978		3,616	20,758	51,613	22,839	1,136			
1979	1,534	3,159	16,001	80,761	39,130	851	141,436		
1980	15	4,830	10,413	58,879	27,603	3,409	105,149		
1981	0	1,050	29,283	97,369	49,079	1,348	178,129		
1982	0	5,083	13,907	32,119	20,417	334	71,860	19,790	3.63
1983	560	6,283	31,679	68,304	13,110	134	120,070	28,988	4.14
1984	69	12,586	28,841	61,586	10,591	114	113,787	27,615	4.12
1985	223	10,160	34,439	49,235	4,171	91	98,319	10,731	9.16
1986	347	20,207	40,128	99,601	14,798	138	175,219	16,414	10.67
1987	0	2,309	30,007	63,125	8,298	18	103,757	13,260	7.82
1988	0	6,491	32,391	60,038	7,393	68	106,381	23,118	4.60
1989	61	13,392	67,329	114,496	19,778	0	215,056	25,200	8.53
1990	45	6,185	22,572	48,488	8,586	9	85,885	37,700	2.28
1991	357	6,897	66,055	109,487	8,533	0	191,329	20,743	9.22
1992	6	2,459	22,318	33,018	1,556	0	59,357	25,381	2.34
1993	6	5,172	27,364	65,264	4,666	0	102,472	28,559	3.59
1994	0	597	16,123	21,496	5,290	0	43,506	25,889	1.68
1995	16	1,675	11,955	45,883	6,865	10	66,403	32,262	2.06
1996	6	194	20,831	43,183	11,230	2	75,446	28,410	2.66
1997	6	3,527	25,679	73,716	6,852	14	109,795	37,684	2.91
1998	0	3,419	30,372	69,404	3,082	5	106,282	16,751	6.34
1999	126	1,542	26,626	52,966				11,362	
2000	0	5,555	29,016					11,344	
2001	0	1,476						42,438	
2002	42							40,145	
2003								47,486	
2004								37,165	
2005								31,268	
2006								27,990	
Average (1982-1999)							108,525	23,881	4.54

Contrast	**4.43**

Appendix Table A9.–Chinook salmon age and sex percentages from selected Yukon River escapement projects, 2006.

Location	Sample Size		Age 3	4	5	6	7	8	Total
Anvik River [a]	169	Males	0.0	10.7	39.6	6.5	0.0	0.0	56.8
		Females	0.0	0.0	8.3	34.9	0.0	0.0	43.2
		Total	0.0	10.7	47.9	41.4	0.0	0.0	100.0
Chena River [a]	362	Males	0.0	12.7	32.3	8.3	0.8	0.0	54.1
		Females	0.0	0.0	13.3	32.3	0.3	0.0	45.9
		Total	0.0	12.7	45.6	40.6	1.1	0.0	100.0
East Fork	454	Males	0.0	14.2	36.2	7.0	0.0	0.0	57.4
Andreafsky River [b]		Females	0.0	2.8	18.7	21.1	0.0	0.0	42.6
		Total	0.0	17.0	54.9	28.1	0.0	0.0	100.0
Gisasa River [b]	530	Males	0.0	13.5	54.3	3.9	0.1	0.0	71.8
		Females	0.1	5.4	12.9	9.7	0.1	0.0	28.2
		Total	0.1	18.9	67.2	13.6	0.2	0.0	100.0
Salcha River [a]	509	Males	0.0	5.7	40.5	9.8	0.6	0.0	56.6
		Females	0.0	0.0	8.8	33.2	1.4	0.0	43.4
		Total	0.0	5.7	49.3	43.0	2.0	0.0	100.0
Tozitna River [b]	69	Males	0.0	13.0	72.5	2.9	0.0	0.0	88.4
		Females	0.0	0.0	10.1	1.5	0.0	0.0	11.6
		Total	0.0	13.0	82.6	4.4	0.0	0.0	100.0
Sheenjek River [c]	35	Males	0.0	5.7	51.4	5.7	0.0	0.0	62.9
		Females	0.0	2.9	25.7	8.6	0.0	0.0	37.1
		Total	0.0	8.6	77.1	14.3	0.0	0.0	100.0

[a] Samples were collected from carcasses.
[b] Samples were collected from a weir trap.
[c] Samples were collected with 8.0” mesh gillnets.

Appendix Table A10.–Summer chum salmon age and sex percentages from selected Yukon River escapement projects, 2006.

			Age					
Location	Sample Size		3	4	5	6	7	Total
Anvik River [a]	482	Males	0.7	15.7	32.9	0.0	0.0	49.3
		Females	0.6	24.1	26.0	0.0	0.0	50.7
		Total	1.3	39.8	58.9	0.0	0.0	100.0
East Fork	658	Males	0.0	12.1	39.2	0.1	0.0	51.4
Andreafsky River [b]		Females	0.6	15.2	32.8	0.0	0.0	48.6
		Total	0.6	27.3	72.0	0.1	0.0	100.0
Gisasa River [b]	496	Males	0.0	6.3	41.5	0.0	0.0	47.8
		Females	0.1	5.1	47.0	0.0	0.0	52.2
		Total	0.1	11.4	88.5	0.0	0.0	100.0
Tozitna River [b]	543	Males	0.0	12.8	33.4	0.0	0.0	46.2
		Females	0.1	22.2	31.4	0.0	0.0	53.8
		Total	0.1	35.0	64.9	0.0	0.0	100.0

[a] Samples were collected by beach seine.
[b] Samples were collected from a weir trap.

Appendix Table A11.–Total Yukon River Chinook salmon harvest proportion by stock group, 1981–2006.

			Upper [d]		
Year [a]	Lower [b]	Middle [c]	U.S.	Canada	Total
1981	0.054	0.545	0.313	0.088	0.401
1982	0.139	0.247	0.513	0.101	0.614
1983	0.129	0.337	0.446	0.087	0.533
1984	0.253	0.402	0.251	0.094	0.345
1985	0.276	0.223	0.409	0.092	0.501
1986	0.195	0.096	0.587	0.122	0.709
1987	0.159	0.196	0.560	0.086	0.645
1988	0.218	0.158	0.498	0.126	0.625
1989	0.244	0.159	0.494	0.102	0.597
1990	0.202	0.252	0.433	0.114	0.547
1991	0.280	0.253	0.349	0.118	0.467
1992	0.163	0.218	0.523	0.096	0.619
1993	0.215	0.254	0.439	0.092	0.531
1994	0.182	0.214	0.494	0.110	0.604
1995	0.179	0.224	0.492	0.105	0.597
1996	0.210	0.104	0.562	0.124	0.686
1997	0.264	0.168	0.482	0.086	0.569
1998	0.327	0.174	0.442	0.056	0.498
1999	0.401	0.063	0.445	0.091	0.536
2000	0.339	0.123	0.441	0.097	0.538
2001	0.316	0.160	0.365	0.159	0.524
2002	0.194	0.292	0.393	0.121	0.514
2003	0.068	0.289	0.554	0.089	0.643
2004 [e]	0.153	0.288	0.468	0.091	0.559
2005 [e]	0.207	0.214	0.464	0.115	0.579
2006 [f]					
Average (1981-2004)	0.206	0.235	0.458	0.101	0.559

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] From 1981 through 2003, the Lower River stock group included Koyukuk River stocks downstream from and including the Gisasa River, and those stocks spawning in Yukon River tributaries downstream from the Koyukuk River. Beginning in 2004, Yukon River tributaries between the Koyukuk and Tanana rivers were included with the Lower River stock group.

[c] From 1981 through 2003, the Middle River stock group included all Tanana River stocks, all Koyukuk River stocks upstream from the Gisasa River, and those stocks spawning in Yukon River tributaries between the Koyukuk and Tanana rivers. Beginning in 2004, those stocks spawning in Alaskan tributaries upstream of the Yukon River and Tanana River confluence were added to the Middle River stock group and Yukon River tributaries between the Koyukuk and Tanana rivers were excluded.

[d] From 1981 through 2003, the Upper River stock group included all stocks spawning upstream from the Yukon River and Tanana River confluence. Beginning in 2004, the Upper River stock group included all Yukon River stocks spawning upstream from Fort Yukon.

[e] Lower, Middle, and Upper stock group boundaries changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper stock group only.

[f] 2006 data are not available.

Appendix Table A12.–Yukon River Chinook salmon harvest proportion by stock group in Alaska, 1981–2006.

	Stock Group		
Year [a]	Lower [b]	Middle [c]	Upper [d]
1981	0.059	0.598	0.343
1982	0.154	0.275	0.571
1983	0.142	0.370	0.489
1984	0.280	0.443	0.277
1985	0.304	0.246	0.451
1986	0.223	0.109	0.668
1987	0.174	0.214	0.612
1988	0.249	0.181	0.570
1989	0.272	0.177	0.551
1990	0.228	0.284	0.488
1991	0.318	0.287	0.396
1992	0.180	0.241	0.578
1993	0.237	0.280	0.483
1994	0.204	0.241	0.555
1995	0.200	0.250	0.550
1996	0.240	0.118	0.642
1997	0.289	0.183	0.528
1998	0.347	0.185	0.468
1999	0.441	0.069	0.490
2000	0.375	0.136	0.489
2001	0.375	0.190	0.435
2002	0.221	0.333	0.446
2003	0.075	0.317	0.608
2004 [e]	0.169	0.316	0.515
2005 [e]	0.234	0.242	0.524
2006 [f]			
Average (1981-2004)	0.227	0.259	0.505

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] From 1981 through 2003, the Lower River stock group included Koyukuk River stocks downstream from and including the Gisasa River, and those stocks spawning downstream from the Koyukuk River. Beginning in 2004, Yukon River tributaries between the Koyukuk and Tanana rivers were included with the Lower River stock group.

[c] From 1981 through 2003, the Middle River stock group included all Tanana River stocks, all Koyukuk River stocks upstream from the Gisasa River, and those stocks spawning in Yukon River tributaries between the Koyukuk and Tanana rivers. Beginning in 2004, those stocks spawning in Alaskan tributaries upstream of the Yukon River and Tanana River confluence were added to the Middle River stock group and Yukon River tributaries between the Koyukuk and Tanana rivers were excluded.

[d] From 1981 through 2003, the Upper River stock group included all stocks spawning upstream from the Yukon River and Tanana River confluence. Beginning in 2004, the Upper River stock group included all Yukon River stocks spawning upstream from Fort Yukon.

[e] Lower, Middle, and Upper stock group boundaries changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper stock group only.

[f] 2006 data are not available.

Appendix Table A13.–Upper stock group proportion, by country, from the Yukon River Chinook salmon harvest, 1981–2006.

	Upper Stock Group	
Year [a]	Alaska	Canada
1981	0.781	0.219
1982	0.835	0.165
1983	0.837	0.163
1984	0.727	0.273
1985	0.816	0.184
1986	0.827	0.173
1987	0.867	0.133
1988	0.798	0.202
1989	0.829	0.171
1990	0.792	0.208
1991	0.748	0.252
1992	0.845	0.155
1993	0.826	0.174
1994	0.818	0.182
1995	0.824	0.176
1996	0.819	0.181
1997	0.848	0.152
1998	0.888	0.112
1999	0.830	0.170
2000	0.819	0.181
2001	0.698	0.303
2002	0.763	0.235
2003	0.862	0.138
2004 [b]	0.837	0.163
2005 [b]	0.801	0.199
2006 [c]		
Average (1981-2004)	0.820	0.180

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis and the Upper River stock group included all stocks spawning upstream from the Yukon River and Tanana River confluence. Beginning in 2004, genetic analysis was used for stock identification and the Upper River stock group included all Yukon River stocks spawning upstream from Fort Yukon.

[b] Lower, Middle, and Upper stock group boundaries changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper stock group only.

[c] 2006 data are not available.

Appendix Table A14.–Summary of releases for coded wire tagged Chinook salmon from Whitehorse Hatchery, 1985–2006.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Days [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	25-May-85	02-32-48	26,670	518	0.0191 [b]		27,188		0	
Michie	25-May-85	02-32-26	28,269	518	0.0180 [b]		28,787		0	
Michie	25-May-85	02-32-47	43,325	518	0.0118 [b]		43,843		0	
Wolf	1985	no-clip	0	0			0		10,520	10,520
SUM	1985		98,264	1,555			99,819		10,520	110,339
Michie	1986	02-37-31	77,170				77,170		1,000	78,170
Wolf	1986						0		5,720	5,720
SUM	1986		77,170				77,170		6,720	83,890
Michie	05-Jun-87	02-48-12	47,644	1,361	0.0278 [b]		49,005	2.50	9,598	58,603
Michie	05-Jun-87	02-48-13	49,344	808	0.0161 [b]		50,152	2.50	9,141	59,293
Michie	05-Jun-87	02-48-14	51,888	559	0.0107 [b]		52,447	2.50	9,422	61,869
Michie	05-Jun-87	02-48-15	43,367	2,066	0.0455 [b]		45,433	2.50	7,868	53,301
Michie	05-Jun-87	02-42-58	25,945	245	0.0094 [b]		26,190	2.50	4,171	30,361
Wolf	30-May-87	02-42-59	26,752	123	0.0046 [b]		26,875	2.50	422	27,297
SUM	1987		244,940	5,162			250,102		40,622	290,724
Michie	10-Jun-88	02-55-49	77,670	1,991	0.0250	15	79,661	2.80	84,903	164,564
Michie	10-Jun-88	02-555-0	78,013	1,592	0.0200	11	79,605	2.70	85,288	164,893
Wolf	05-Jun-88	no-clip	0	0			0		25,986	25,986
SUM	1988		155,683	3,583			159,266		196,177	355,443
Wolf	1989	no-clip	0	0			0		22,388	22,388
Michie	06-Jun-89	02-60-04	26,161	326	0.0123 [b]		26,487	2.30	0	26,487
Michie	06-Jun-89	02-60-05	24,951	128	0.0051 [b]		25,079	2.30	0	25,079
Michie	06-Jun-89	02-60-06	25,098	291	0.0115 [b]		25,389	2.40	0	25,389
Michie	06-Jun-89	02-60-07	25,233	156	0.0061 [b]		25,389	2.20	95,724	121,113
Fishway	06-Jun-89	02-60-08	25,194	357	0.0140 [b]		25,551	2.70	0	25,551
Fishway	06-Jun-89	02-60-09	25,190	351	0.0137 [b]		25,541	2.70	0	25,541
SUM	1989		151,827	1,609			153,436		118,112	271,548
Wolf	06-Jun-90	no-clip	0	0			0		11,969	11,969
Michie	02-Jun-90	02-02-38	24,555	501	0.0200 [b]		25,056	2.30	0	25,056
Michie	02-Jun-90	02-02-39	24,345	753	0.0300 [b]		25,098	2.30	0	25,098
Fishway	02-Jun-90	02-02-60	24,508	501	0.0200 [b]		25,009	2.20	0	25,009
Fishway	02-Jun-90	02-02-63	25,113	254	0.0100 [b]		25,367	2.20	0	25,367
SUM	1990		98,521	2,009			100,530		11,969	112,499
Wolf	08-Jun-91	18-03-22	49,477	793	0.0158 [b]		50,270	2.30	0	50,270
Fishway	06-Jun-91	18-03-23	52,948	193	0.0036 [b]		53,141	2.30	0	53,141
Michie	06-Jun-91	18-03-24	50,020	176	0.0035 [b]		50,196	2.30	87,348	137,544
SUM	1991		152,445	1,162			153,607		87,348	240,955
Wolf	04-Jun-92	18-08-29	48,239	0	0.0000 [b]		48,239	2.40	0	48,239
Fishway	04-Jun-92	18-08-28	49,356	99	0.0020 [b]		49,455	2.30	0	49,455
Michie	04-Jun-92	18-08-30	52,946	643	0.0120 [b]		53,589	2.20	249,166	302,755
SUM	1992		150,541	742			151,283		249,166	400,449
Wolf	06-Jun-93	18-12-15	50,248	0	0.0000 [b]		50,248	2.30	0	50,248
Fishway	06-Jun-93	18-12-16	49,957	434	0.0086 [b]		50,391	2.30	0	50,391
Michie	06-Jun-93	18-12-17	50,169	0	0.0000 [b]		50,169	2.30	290,647	340,816
SUM	1993		150,374	434			150,808		290,647	441,455
Wolf	02-Jun-94	18-14-27	50,155	270	0.0054 [b]		50,425	2.30	0	50,425
Michie	02-Jun-94	18-14-28	50,210	127	0.0025 [b]		50,337	2.30	158,780	209,117
Fishway	02-Jun-94	18-14-29	50,415	125	0.0025 [b]		50,540	2.30	0	50,540
SUM	1994		150,780	522			151,302		158,780	310,082
Wolf	06-Jun-95	18-12-46	10,067	164	0.0160	3	10,231	1.67	0	10,231
Wolf	06-Jun-95	18-12-47	9,122	0	0.0000	3	9,122	1.53	0	9,122
Michie	06-Jun-95	18-18-26	25,231	337	0.0132	3	25,568	2.47	4,552	30,120
Michie	06-Jun-95	18-18-27	25,187	141	0.0056	3	25,328	2.33	0	25,328
SUM	1995		69,607	642			70,249		4,552	74,801

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Appendix Table A14.–Page 2 of 3.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Days [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Wolf	26-May-96	18-07-48	10,131	102	0.0100	5	10,233	2.30	0	10,233
Fox	4-Jun-96	18-28-23	35,452	0	0.0000	5	35,452	2.43	0	35,452
Byng	4-Jun-96	18-10-41	25,263	516	0.0200	5	25,779	2.37	0	25,779
Michie	5-Jun-96	18-33-45	50,082	1,022	0.0200	5	51,104	2.51	0	51,104
Michie	5-Jun-96	18-33-46	50,260	508	0.0100	5	50,768	2.43	0	50,768
Michie	5-Jun-96	18-33-47	49,985	505	0.0100	5	50,490	2.32	0	50,490
Judas	4-Jun-96	18-33-48	49,798	1,016	0.0200	5	50,814	2.43	0	50,814
McClintock	4-Jun-96	18-33-49	49,991	302	0.0060	5	50,293	2.27	0	50,293
SUM	1996		320,962	3,971			324,933		0	324,933
Wolf	1-Jun-97	18-23-25	14,850	150	0.0100	2	15,000	2.30	0	15,000
Wolf	1-Jun-97	18-23-26	20,334	0	0.0000	4	20,334		0	20,334
Wolf	8-Jun-97	18-29-06	10,158	0	0.0000	8	10,158		0	10,158
Fox	11-Jun-97	18-25-54	25,242	0	0.0000	3	25,242	2.43	0	25,242
Fox	11-Jun-97	18-25-55	24,995	253	0.0100	3	25,248		0	25,248
Byng	11-Jun-97	18-29-07	10,029	0	0.0000	1	10,029	2.37	0	10,029
Byng	11-Jun-97	18-29-05	10,155	0	0.0000	1	10,155		0	10,155
Michie	11-Jun-97	18-28-59	49,657	502	0.0100	3	50,159	2.51	0	50,159
Michie	11-Jun-97	18-28-60	50,130	0	0.0000	3	50,130	2.43	0	50,130
Judas	7-Jun-97	18-23-27	19,951	202	0.0100	3 to 7	20,153	2.43	0	20,153
Judas	11-Jun-97	18-25-53	25,146	0	0.0000	11	25,146	2.43	0	25,146
McClintock	11-Jun-97	18-25-51	25,399	0	0.0000	3	25,399	2.27	0	25,399
McClintock	11-Jun-97	18-25-52	24,792	251	0.0100	3	25,043		0	25,043
SUM	1997		310,838	1,358			312,196		0	312,196
Michie	12-Jun-98	18-41-22	49,243	1,004	0.0200	5	50,247	2.84	0	50,247
Michie	12-Jun-98	18-41-21	49,197	1,004	0.0200	5	50,201	2.81	0	50,201
Byng	12-Jun-98	18-31-60	24,518	1,022	0.0400	5	25,540	3.00	0	25,540
McClintock	12-Jun-98	18-40-43	49,810	503	0.0100	5	50,313	2.76	0	50,313
Judas	13-Jun-98	02-54-17	19,018	1,432	0.0700	5	20,450	2.55	0	20,450
Judas	12-Jun-98	18-31-59	25,331	256	0.0100	5	25,587	2.60	0	25,587
Wolf	6-Jun-98	02-19-58	10,104	421	0.0400	5	10,525	1.95	0	10,525
Wolf	4-Jun-98	02-46-06	34,813	710	0.0200	5	35,523	2.63	0	35,523
SUM	1998		262,034	6,352			268,386		0	268,386
Michie	6-Jun-99			80,393			80,393	3.13	0	80,393
Byng	6-Jun-99			64,430			64,430	2.92	0	64,430
McClintock	6-Jun-99			64,169			64,169	2.95	0	64,169
Wolf	6-Jun-99			31,048			31,048	3.07	0	31,048
SUM	1999			240,040			240,040		0	240,040
Michie	8-Jun-00	18-31-28	25,114	254	0.0100	5	25,368	2.80	0	25,368
Michie	8-Jun-00	18-31-29	25,037	253	0.0100	5	25,290	2.80	0	25,290
Michie	8-Jun-00	18-43-03	10,907	110	0.0100	5	11,017	2.84	0	11,017
McClintock	8-Jun-00	18-13-54	25,041	254	0.0100	5	25,295	2.70	0	25,295
McClintock	8-Jun-00	18-13-55	25,016	253	0.0100	5	25,269	2.68	0	25,269
Wolf	4-Jun-00	18-23-53	25,071	253	0.0100	5	25,324	2.67	0	25,324
Wolf	4-Jun-00	18-23-54	25,012	254	0.0101	5	25,266	2.40	0	25,266
SUM	2000		161,198	1,631			162,829		0	162,829
Michie	8-Jun-01	18-44-16	25,318	256	0.0100	5	25,574	2.68	0	25,574
Michie	8-Jun-01	18-44-17	27,293	276	0.0100	5	27,569	2.68	0	27,569
Michie	8-Jun-01	18-44-18	27,337	276	0.0100	5	27,613	2.60	0	27,613
Michie	8-Jun-01	18-44-19	11,629	117	0.0100	5	11,746	2.60	0	11,746
McClintock	8-Jun-01	18-44-12	24,526	248	0.0100	5	24,774	3.13	0	24,774
McClintock	8-Jun-01	18-44-13	25,033	253	0.0100	5	25,286	3.13	0	25,286
McClintock	8-Jun-01	18-36-50	10,840	110	0.0100	5	10,950	3.13	0	10,950
Byng	8-Jun-01	18-44-14	25788	260	0.0100	5	26,048	2.84	0	26,048
Byng	8-Jun-01	18-44-15	25,136	254	0.0100	5	25,390	2.84	0	25,390
Wolf	28-May-01	18-44-10	26,205	265	0.0100	5	26,470	3.34	0	26,470
Wolf	28-May-01	18-44-11	23,902	241	0.0100	5	24,143	3.34	0	24,143
SUM	2001		253,007	2,556			255,563		0	255,563

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Appendix Table A14.–Page 3 of 3.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Days [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Wolf	23-May-02	18-51-01	25,334	126	0.0049	5	25460	3.30	0	25460
Wolf	02-Jun-02	18-51-02	25,079	177	0.0070	5	25256	3.10	0	25256
McClintock	10-Jun-02	18-51-03	24,769	505	0.0200	5	25274	3.60	0	25274
Byng	10-Jun-02	18-51-04	24,907	0	0.0000	5	24907	3.00	0	24907
Byng	10-Jun-02	18-51-05	24,925	125	0.0050	5	25050	3.00	0	25050
Michie	10-Jun-02	18-51-06	27,114	191	0.0070	5	27305	3.20	0	27305
Michie	10-Jun-02	18-51-07	26,854	0	0.0000	5	26854	3.02	0	26854
Michie	10-Jun-02	18-50-61	27,850	281	0.0100	5	28131	3.20	0	28131
Michie	10-Jun-02	18-50-62	27,241	0	0.0000	5	27241	3.04	0	27241
Michie	10-Jun-02	18-50-63	8,481	86	0.0100	5	8567	3.20	0	8567
SUM	2002		242,554	1,491			244,045		0	244,045
Wolf	25-May-03	18-47-48	27,489	83	0.0030	5	27,572	2.72	0	27,572
Wolf	25-May-03	18-47-49	26,704	161	0.0060	5	26,865	2.69	0	26,865
Byng	2-Jun-03	18-47-47	23,483	71	0.0030	5	23,554	3.01	0	23,554
Byng	2-Jun-03	18-47-46	27,058	54	0.0020	5	27,112	2.98	0	27,112
Michie	2-Jun-03	18-49-58	28,485	0	0.0000	5	28,485	3.05	0	28,485
Michie	2-Jun-03	18-49-59	27,519	0	0.0000	5	27,519	2.98	0	27,519
Michie	2-Jun-03	18-49-60	15,541	0	0.0000	5	15,541	3.07		15,541
SUM	2003		176,279	369			176,648		0	176,648
Wolf	5/28-30/2004	01-01-70	28,946	2,806		5	31,752	2.90	0	31,752
Mainstem	5/28-29/2004	02-01-69	24,920	431		5	25,351	3.10	0	25,351
Byng	8-Jun-04	02-01-68	24,401	626		5	25,027	3.36	0	25,027
McClintock	8-Jun-04	02-01-67	24,246	879		5	25,125	3.20	0	25,125
Michie	8-Jun-04	02-01-66	24,609	554		5	25,163	3.12	0	25,163
Michie	8-Jun-04	02-01-65	13,594	306		5	13,900	3.12	0	13,900
SUM	2004		140,716	5,602			146,318			146,318
Wolf	5/31-6/05	18-19-36	10,751	109	1.0000	5	10,860	2.50	0	10,860
Wolf	5/31-6/05	18-56-17	5,835	59	1.0000	5	5,894	2.50	0	5,894
Byng	13-Jun-05	18-56-18	5,853	119	2.0000	5	5,972	2.50	0	5,972
Byng	13-Jun-05	18-56-19	4,369	89	2.0000	5	4,458	2.50	0	4,458
McClintock	13-Jun-05	18-44-19	10,632	0	0.0000	5	10,632	2.50	0	10,632
Michie	13-Jun-05	02-01-64	4,870	0	0.0000	5	4,870	2.50	0	4,870
Michie	13-Jun-05	02-01-65	5,983	0	0.0000	5	5,983	2.50	0	5,983
Michie	13-Jun-05	08-01-65	28,082	284	1.0000	5	28,366	2.50	0	28,366
Michie	13-Jun-05	18-56-20	5,906	0	0.0000	5	5,906	2.50	0	5,906
Mainstem	6/02,6/14,07/7	08-01-68	28,991	293	1.0000	5	29,284	2.50	0	29,284
SUM	2005		111,272	953			112,225			112,225
Wolf	6/4 - 6/11	08-01-66	26,412	0	0.0000	2	26,412	2.66	0	26,412
Wolf	6/4 - 6/11	08-01-71	8,718	88	1.0000	2	8,806	2.66	0	8,806
Mainstem	8-Jun-06	08-01-72	6,761	427	1.5000	2	7,188	2.63	0	7,188
Mainstem	8-Jun-06	08-01-67	28,045	103	1.5000	2	28,148	2.63	0	28,148
Michie	14-Jun-06	08-01-69	39,164	596	1.5000	2	39,760		0	39,760
Michie	14-Jun-06	08-01-74	3,692	56	1.5000	2	3,748	2.41	0	3,748
McClintock	14-Jun-06	08-01-70	29,282	296	1.0000	5	29,578	2.58	0	29,578
McClintock	14-Jun-06	08-01-73	5,426	55	1.0000	5	5,481	2.89	0	5,481
Wolf	11-Jun-06		0	7,658	0.0000		7,658	3.02	0	7,658
SUM	2006		147,500	9,279			156,779			156,779
TOTAL			3,626,512	291,022			3,917,534		1,174,613	5,092,147

[a] The number of days refers to the time period when fish were held to determine tag loss.

[b] Unknown period.

[c] Usually corresponds to "tagged" category on MRP release forms. CWT Data recorded from CWT release sheets 1989–1994. CWT Data prior to 1987 not verified against SEP records.

Appendix Table A15.–Summary of releases of Chinook salmon from Yukon Territory instream incubation/rearing sites 1991–2006.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
Klondike R, Nor	chinook	1990	Tatchun R	02-01-01-02-12	Spring Fry	Tatchun R	91/06/28	91/06/28	13593	21	650	14264	0.74
Klondike R, Nor	chinook	1990	Tatchun R	02-01-01-02-09	Spring Fry	Tatchun R	91/06/28	91/06/28	15247	173	750	16170	0.74
Klondike R, Nor	chinook	1991	Tatchun R	18-06-45	Spring Fry	Tatchun R	/ /	92/08/31	11734	0	817	12551	2.47
Klondike R, Nor	chinook	1991	Tatchun R	02-33-56	Spring Fry	Tatchun R	/ /	92/08/31	6453	0	852	7305	2.47
Klondike R, Nor	chinook	1991	Tatchun R	18-06-44	Spring Fry	Tatchun R	/ /	92/08/31	11585	0	320	11905	2.47
Klondike R, Nor	chinook	1991	Yukon R	NOCN9148	Spring Fry	Pothole Lk	92/06/	92/06/	0	0	1500	1500	0
Klondike R, Nor	chinook	1993	Klondike R Nor	02-01-01-05-03	Spring Fry	Klondike R Nor	94/06/30	94/06/30	6174	10	54	6238	0.88
Klondike R, Nor	chinook	1993	Tatchun R	02-01-01-04-07	Spring Fry	Tatchun R	94/06/30	94/06/30	12077	246	71	12394	0.99
Klondike R, Nor	chinook	1993	Tatchun R	02-01-01-05-05	Spring Fry	Tatchun R	94/06/30	94/06/30	9982	0	61	10043	0.99
Klondike R, Nor	chinook	1994	Klondike R Nor	02-01-01-06-03	Spring Fry	Klondike R Nor	95/07/04	95/07/04	2159	11	190	2360	0.75
Klondike R, Nor	chinook	1994	Klondike R Nor	02-01-01-06-02	Spring Fry	Klondike R Nor	95/07/04	95/07/04	1809	16	56	1881	0.75
Klondike R, Nor	chinook	1994	Tatchun R	02-01-01-05-11	Spring Fry	Tatchun R	95/07/04	95/07/04	12431	100	686	13217	0.81
Klondike R, Nor	chinook	1994	Tatchun R	02-01-01-05-15	Spring Fry	Tatchun R	95/07/04	95/07/04	2490	33	177	2700	0.81
Klondike R, Nor	chinook	1994	Tatchun R	02-01-01-06-01	Spring Fry	Tatchun R	95/07/04	95/07/04	1476	19	155	1650	0.81
Klondike R, Nor	chinook	1994	Tatchun R	02-01-01-05-13	Spring Fry	Tatchun R	95/07/04	95/07/04	11649	238	413	12300	0.81
Klondike R, Nor	chinook	1995	Klondike R Nor	02-01-01-04-08	Spring Fry	Klondike R Nor	96/06/22	96/06/22	11423	1707	0	13130	0.76
Mayo River	chinook	1991	Mayo R	NOCN9147	Spring Fry	Mayo R	92/06/	92/06/	0	0	13000	13000	0
Mayo River	chinook	1992	Mayo R	NOCN9292	Spring Fry	Mayo R	93/07/	93/07/	0	0	500	500	0
McIntyre Cr	chinook	1990	Takhini R	02-33-55	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	7967	80	39	8086	3.2
McIntyre Cr	chinook	1990	Takhini R	02-33-54	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	10789	109	101	10999	3.2
McIntyre Cr	chinook	1991	Takhini R	02-01-01-03-08	Spring Fry	Flat Cr	/ /	92/07/04	12141	143	3425	15709	0.98
McIntyre Cr	chinook	1991	Takhini R	02-01-01-03-09	Spring Fry	Flat Cr	/ /	92/07/04	13102	466	1398	14966	0.98
McIntyre Cr	chinook	1991	Takhini R	02-01-01-03-10	Spring Fry	Flat Cr	/ /	92/07/04	4955	261	601	5817	0.98
McIntyre Cr	chinook	1992	Klondike R Nor	02-01-01-04-04	Spring Fry	Klondike R Nor	93/07/01	93/07/01	12832	240	144	13216	1.14
McIntyre Cr	chinook	1992	Klondike R Nor	02-01-01-04-05	Spring Fry	Klondike R Nor	93/07/01	93/07/01	7546	256	167	7969	1.14
McIntyre Cr	chinook	1992	Takhini R	02-34-24	Spring Fry	Flat Cr	93/08/17	93/08/17	9532	823	95	10450	2.71
McIntyre Cr	chinook	1992	Takhini R	02-34-23	Spring Fry	Flat Cr	93/08/17	93/08/17	9822	850	218	10890	2.71
McIntyre Cr	chinook	1992	Takhini R	18-14-54	Spring Fry	Flat Cr	93/08/17	93/08/17	10925	567	227	11719	2.71
McIntyre Cr	chinook	1992	Takhini R	18-14-53	Spring Fry	Flat Cr	93/08/17	93/08/17	10658	865	226	11749	2.71
McIntyre Cr	chinook	1992	Takhini R	02-02-17	Spring Fry	Flat Cr	93/08/17	93/08/17	2291	114	37	2442	2.71
McIntyre Cr	chinook	1992	Takhini R	02-34-22	Spring Fry	Flat Cr	93/08/17	93/08/17	10355	314	40	10709	2.71
McIntyre Cr	chinook	1992	Tatchun R	02-01-01-04-02	Spring Fry	Tatchun R	93/06/17	93/06/17	4654	633	335	5622	0.76

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Appendix Table A15.–Page 2 of 3.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	chinook	1993	Takhini R	18-17-51	Spring Fry	Flat Cr	94/08/26	94/08/31	7410	46	222	7678	2.6
McIntyre Cr	chinook	1993	Takhini R	18-17-50	Spring Fry	Flat Cr	94/08/26	94/08/31	11227	40	87	11354	2.6
McIntyre Cr	chinook	1993	Takhini R	18-17-49	Spring Fry	Flat Cr	94/08/26	94/08/31	11071	159	142	11372	2.6
McIntyre Cr	chinook	1993	Takhini R	18-17-48	Spring Fry	Flat Cr	94/08/26	94/08/31	11375	0	104	11479	2.6
McIntyre Cr	chinook	1993	Takhini R	18-17-52	Spring Fry	Flat Cr	94/08/26	94/08/31	10668	21	198	10887	2.6
McIntyre Cr	chinook	1993	Takhini R	02-02-16	Spring Fry	Takhini R	94/08/30	94/08/30	9343	271	36	9650	2.8
McIntyre Cr	chinook	1993	Takhini R	02-01-63	Spring Fry	Takhini R	94/08/30	94/08/30	10899	222	62	11183	2.8
McIntyre Cr	chinook	1994	Takhini R	02-01-01-04-15	Spring Fry	Takhini R	95/08/14	95/08/14	9887	0	410	10297	2.2
McIntyre Cr	chinook	1994	Takhini R	02-01-01-04-13	Spring Fry	Takhini R	95/08/14	95/08/14	14452	0	365	14817	2.2
McIntyre Cr	chinook	1994	Takhini R	02-01-01-04-12	Spring Fry	Flat Cr	95/08/14	95/08/14	14193	59	281	14533	2.2
McIntyre Cr	chinook	1994	Takhini R	02-01-01-04-14	Spring Fry	Flat Cr	95/08/14	95/08/14	13586	130	295	14011	2.2
McIntyre Cr	chinook	1995	Takhini R	02-01-01-05-08	Spring Fry	Takhini R	96/08/12	96/08/12	15731	251	496	16478	2.1
McIntyre Cr	chinook	1995	Takhini R	02-01-01-05-09	Spring Fry	Takhini R	96/08/12	96/08/12	8085	41	293	8419	2.1
McIntyre Cr	chinook	1995	Takhini R	02-01-01-05-10	Spring Fry	Flat Cr	96/08/07	96/08/07	10727	65	170	10962	2.01
McIntyre Cr	chinook	1995	Tatchun R	02-01-01-02-10	Spring Fry	Tatchun R	96/06/27	96/06/27	14530	49	62	14641	0.81
McIntyre Cr	chinook	1995	Tatchun R	02-01-01-02-11	Spring Fry	Tatchun R	96/06/27	96/06/27	13526	91	294	13911	0.81
McIntyre Cr	chinook	1996	Takhini R	02-01-01-06-14	Spring Fry	Flat Cr	97/07/02	97/07/04	15622	158	382	16162	0.8
McIntyre Cr	chinook	1996	Takhini R	02-01-01-04-06	Spring Fry	Flat Cr	97/07/02	97/07/04	14845	37	280	15162	0.8
McIntyre Cr	chinook	1996	Tatchun R	02-01-01-07-03	Spring Fry	Tatchun R	97/06/27	97/06/27	1521	15	148	1684	1
McIntyre Cr	chinook	1997	Tatchun R	02-01-01-06-08	Spring Fry	Tatchun R	98/06/19	98/06/19	9284	150	74	9508	1.1
McIntyre Cr	chinook	1997	Tatchun R	02-01-01-06-09	Spring Fry	Tatchun R	98/06/19	98/06/19	10318	211	188	10717	1.1
McIntyre Cr	chinook	1997	Tatchun R	02-01-01-07-02	Spring Fry	Tatchun R	98/06/19	98/06/19	2536	52	0	2588	1.1
McIntyre Cr	chinook	1997	Takhini R	02-01-01-07-09	Spring Fry	Flat Cr	98/06/22	98/06/22	11374	115	115	11604	1.1
McIntyre Cr	chinook	1997	Takhini R	02-01-01-06-11	Spring Fry	Takhini R	98/06/23	98/06/23	12933	334	118	13385	1.1
McIntyre Cr	chinook	1997	Takhini R	02-01-01-06-10	Spring Fry	Takhini R	98/06/23	98/06/23	12186	37	115	12338	1.1
McIntyre Cr	chinook	1997	Takhini R	02-01-01-07-08	Spring Fry	Takhini R	98/06/23	98/06/23	12341	253	148	12742	1.1
McIntyre Cr	chinook	1998	Tatchun Cr	02-01-01-06-12	Spring Fry	Tatchun		99/07/08	10363	0	67	10430	
McIntyre Cr	chinook	1998	Tatchun Cr	02-01-01-06-13	Spring Fry	Tatchun		99/07/08	4733	0	82	4815	
McIntyre Cr	chinook	1998	Takhini R.	02-01-01-07-10	Spring Fry	Takhini R		99/07/14	13753	28	148	13929	
McIntyre Cr	chinook	1998	Takhini R.	02-01-01-07-11	Spring Fry	Flat Cr		99/07/15	11273	23	206	11502	
McIntyre Cr	chinook	1999	Takhini R	02-01-0-07-07	Spring Fry	Flat Cr		06/23/00	11333	114	219	11666	0.8
McIntyre Cr	chinook	1999	Takhini R	02-01-01-07-12	Spring Fry	Flat Cr		06/23/00	12246	0	214	12460	0.8
McIntyre Cr	chinook	1999	Takhini R	02-01-01-06-04	Spring Fry	Takhini R		06/24/00	11105	0	147	11252	0.9
McIntyre Cr	chinook	1999	Takhini R	02-01-01-06-05	Spring Fry	Takhini R		06/24/00	12044	0	88	12132	0.9
McIntyre Cr	chinook	1999	Takhini R	02-01-01-06-06	Spring Fry	Takhini R		06/24/00	4561	0	0	4561	0.9
McIntyre Cr	chinook	1999	Tatchun Cr	02-01-01-07-05	Spring Fry	Tatchun		06/19/00	12239	188	409	12836	1
McIntyre Cr	chinook	1999	Tatchun Cr	02-01-01-07-06	Spring Fry	Tatchun		06/19/00	987	10	0	997	1

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Appendix Table A15.–Page 3 of 3.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	chinook	2000	Takhini R	02-01-01-08-01	Spring Fry	Takhini R		07/25/01	11724	163	123	12010	1.1
McIntyre Cr	chinook	2000	Takhini R	02-01-01-08-02	Spring Fry	Flat Cr		07/26/01	9995	101	60	10156	1.1
McIntyre Cr	chinook	2000	Tatchun Cr	02-01-01-07-05	Spring Fry	Tatchun		07/09/01	11654	360	10	12024	1.1
McIntyre Cr	chinook	2000	Tatchun Cr	02-01-01-07-06	Spring Fry	Tatchun		07/09/01	6321	329	14	6664	1.1
McIntyre Cr	chinook	2001	Takhini R	02-01-01-08-04	Spring Fry	Takhini R		06/29/02	10109	314	301	10724	1
McIntyre Cr	chinook	2001	Takhini R	02-01-01-08-05	Spring Fry	Takhini R		06/29/02	9814	100	405	10319	1
McIntyre Cr	chinook	2001	Takhini R	02-01-01-08-07	Spring Fry	Flat Cr		06/28/02	4161	42	0	4203	1
McIntyre Cr	chinook	2001	Tatchun Cr	02-01-01-08-03	Spring Fry	Tatchun		06/27/02	6432	415	279	7126	1
McIntyre Cr	chinook	2002	Takhini R	02-11-22-31-41	Spring Fry	Takhini R		07/21/03	8431	0	55	8486	1.7
McIntyre Cr	chinook	2002	Takhini R	02-11-22-31-42	Spring Fry	Takhini R		07/21/03	14017	0	76	14093	1.7
McIntyre Cr	chinook	2002	Takhini R	02-01-01-07-01	Spring Fry	Takhini R		07/21/03	11589	13	104	11706	1.7
McIntyre Cr	chinook	2002	Takhini R	02-11-21-38-46	Spring Fry	Flat Cr		07/22/03	6426	65	0	6491	1.7
McIntyre Cr	chinook	2002	Tatchun Cr	02-01-01-07-14	Spring Fry	Tatchun		07/04/03	10746	50	79	10875	1.4
McIntyre Cr	chinook	2002	Tatchun Cr	02-01-01-07-15	Spring Fry	Tatchun		07/04/03	13261	0	166	13427	1.4
McIntyre Cr	chinook	2003	Tatchun Cr	02-01-02-01-05	Spring Fry	Tatchun Cr		06/27/04	10701	805	0	11506	1.1
McIntyre Cr	chinook	2003	Tatchun Cr	02-01-02-01-04	Spring Fry	Tatchun Cr		06/27/04	9919	556	0	10475	1.1
McIntyre Cr	chinook	2003	Tatchun Cr	02-01-02-01-03	Spring Fry	Tatchun Cr		06/27/04	5249	395	0	5644	1.1
McIntyre Cr	chinook	2003	Takhini R	02-01-02-02-01	Spring Fry	Takhini R		07/12/04	10449	268	0	10717	1.3
McIntyre Cr	chinook	2003	Takhini R	02 01 02 01 06	Spring Fry	Takhini R		07/12/04	11685	178	0	11863	1.3
McIntyre Cr	chinook	2003	Takhini R	02-01-02-01-08	Spring Fry	Flat Cr		08/16/04	7785	95	0	7880	1.1
McIntyre Cr	chinook	2003	Tatchun Cr	02-01-01-09-01	Spring Fry	Tatchun Cr		08/20/04	9381	143	0	9524	1.3
McIntyre Cr	chinook	2003	Tatchun Cr	02-01-01-08-08	Spring Fry	Tatchun Cr		08/20/04	5216	79	0	5295	1.5
McIntyre Cr	chinook	2003	Takhini R	02-01-01-09-03	Spring Fry	Takhini R		08/21/04	10112	154	0	10266	1.2
McIntyre Cr	chinook	2003	Takhini R	02-01-01-09-02	Spring Fry	Takhini R		08/21/04	10180	155	0	10335	1.2
McIntyre Cr	chinook	2003	Takhini R	02-01-02-01-03	Spring Fry	Takhini R		08/21/04	5390	82	0	5472	1.2
McIntyre Cr	chinook	2004	Tatchun Cr	02-01-01-08-09	Spring Fry	Tatchun Cr		06/27/05	2361	426	0	2787	1.3
McIntyre Cr	chinook	2004	Takhini R	02-01-02-02-02	Spring Fry	Takhini R		07/14/05	23068	2175	1100	26343	1.3
McIntyre Cr	chinook	2004	Takhini R	02-01-02-02-03	Spring Fry	Takhini R		07/14/05	9146	1016	1100	11262	1.3
McIntyre Cr	chinook	2004	Takhini R	02-01-02-01-08	Spring Fry	Flat Cr		07/07/05	5592	233	0	5825	1.3
McIntyre Cr	chinook	2005	Takhini R	02-1-2-2-5	Spring Fry	Takhini R		07/10/06	10766	748	0	11514	1.3
McIntyre Cr	chinook	2005	Takhini R	02-1-2-1-9	Spring Fry	Takhini R		07/10/06	10952	534	0	11486	1.6
McIntyre Cr	chinook	2005	Takhini R	02-1-2-2-6	Spring Fry	Takhini R		07/10/06	11108	394	0	11502	1.6
McIntyre Cr	chinook	2005	Takhini R	02-1-2-3-4	Spring Fry	Takhini R		07/18/06	2520	152	0	2672	1.6
McIntyre Cr	chinook	2005	Takhini R	02-1-2-1-7	Spring Fry	Tatchun Cr		07/07/06	9243	182	0	9425	2.4
McIntyre Cr	chinook	2005	Takhini R	02-1-2-3-3	Spring Fry	Tatchun Cr		07/23/06	26094	847	0	26941	2.4

Notes for 2003 Brood Year Releases:

02-01-02-01-03	11506	thermal marked
02-01-02-01-04	10475	not thermal marked
02-01-02-01-03	5644	not thermal marked
02-01-02-01-08	7880	a portion actually released July 12
02-01-01-09-01	9524	not thermal marked
02-01-01-08-08	5295	thermal marked
02-01-02-01-03	5472	error resulted in having the same code as some Tatchun fry

Appendix Table A16.–Yukon River fall chum salmon estimated brood year production and return per spawner estimates 1974–2006.

Year	(P) Escapement	Estimated Annual Totals: Catch	Return	Estimated Brood Year Return: Number of Salmon [a]: Age 3	Age 4	Age 5	Age 6	Percent: Age 3	Age 4	Age 5	Age 6	(R) Total Brood Year Return[a]	(R/P) Return/ Spawner
1974	437,485	478,875	916,360	91,751	497,755	68,693	0	0.139	0.756	0.104	0.000	658,199	1.50
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,227	123	0.105	0.853	0.043	0.000	1,437,241	0.98
1976	268,841	339,043	607,884	102,062	585,820	136,358	4,313	0.123	0.707	0.165	0.005	828,553	3.08
1977	514,843	447,918	962,761	102,370	1,069,856	175,578	4,186	0.076	0.791	0.130	0.003	1,351,992	2.63
1978	320,487	434,030	754,517	22,112	332,023	90,532	0	0.050	0.747	0.204	0.000	444,667	1.39
1979	780,818	615,377	1,396,195	41,088	769,082	274,310	3,894	0.038	0.707	0.252	0.004	1,088,374	1.39
1980	261,113	488,305	749,418	8,373	362,199	208,962	3,125	0.014	0.622	0.359	0.005	582,658	2.23
1981	551,192	677,257	1,228,449	45,855	955,725	278,386	8,888	0.036	0.742	0.216	0.007	1,288,853	2.34
1982	179,828	373,175	553,003	11,327	400,323	166,754	678	0.020	0.691	0.288	0.001	579,083	3.22
1983	347,157	525,016	872,173	12,569	875,355	223,322	2,304	0.011	0.786	0.201	0.002	1,113,550	3.21
1984	270,042	412,322	682,364	7,089	407,774	173,546	8,493	0.012	0.683	0.291	0.014	596,902	2.21
1985	664,426	515,481	1,179,907	46,605	871,500	270,268	3,194	0.039	0.731	0.227	0.003	1,191,566	1.79
1986	376,374	318,028	694,402	0	428,614	368,513	4,353	0.000	0.535	0.460	0.005	801,479	2.13
1987	651,943	406,143	1,058,086	12,380	617,519	290,767	7,720	0.013	0.665	0.313	0.008	928,386	1.42
1988	325,137	353,242	678,379	41,003	175,236	152,368	10,894 [b]	0.108	0.462	0.401	0.029	379,501	1.17
1989	506,173	541,177	1,047,350	2,744	282,905	345,136 [b]	20,290	0.004	0.435	0.530	0.031	651,075	1.29
1990	369,654	350,100	719,754	710	579,452 [b]	418,448	30,449	0.001	0.563	0.407	0.030	1,029,059	2.78
1991	591,132	439,096	1,030,228	3,663 [b]	1,024,800	369,103	12,167	0.003	0.727	0.262	0.009	1,409,733	2.38
1992	324,253	148,846	473,099	6,763	653,648	197,073	3,907	0.008	0.759	0.229	0.005	861,392	2.66
1993	352,688	91,015	443,703	7,745	451,327	102,404	3,234	0.014	0.799	0.181	0.006	564,711	1.60
1994	769,920	169,225	939,145	4,322	225,209	149,481	1,603 [b]	0.011	0.592	0.393	0.004	380,615	0.49
1995	1,009,155	461,147	1,470,302	2,371	266,873	68,918 [b]	382	0.007	0.788	0.204	0.001	338,544	0.34
1996	800,022	260,923	1,060,945	420	165,691 [b]	136,796	8,295	0.001	0.532	0.440	0.027	311,201	0.39
1997	494,831	170,059	664,890	3,087 [b]	244,603	118,343	3,332	0.008	0.662	0.320	0.009	369,365	0.75
1998	263,121	70,770	333,891	650	269,653	57,962	6,694	0.002	0.805	0.173	0.020	334,960	1.27
1999	288,962	131,046	420,008	29,097	705,152	174,424	12,979	0.032	0.765	0.189	0.014	921,651	3.19
2000	210,756	28,543	239,299	8,446	297,012	109,240	0	0.020	0.716	0.263	0.000	414,699	1.97
2001	337,765	44,666	382,431	136,038	2,040,954	673,528	6,709	0.048	0.714	0.236		2,857,230 [c]	>8.46
2002	397,977	27,411	425,388	0	443,087	91,625						534,712 [d]	>1.34
2003	695,363	79,529	774,892	24,185									
2004	537,873	76,296	614,169										
2005	1,873,090	290,083	2,163,173										
2006	873,987	266,813	1,140,800										
Average-05	538,676	319,913	858,589										
	496,132	**All Brood Years (1974-2000)**		28,335	545,946	192,108	6,130	0.0331	0.6897	0.2683	0.0089	772,519	1.84
	354,737	Even Brood Years (1974-2000)		21,788	384,315	187,321	27,130	0.0364	0.6550	0.2982	0.0104	585,926	1.89
	632,195	Odd Brood Years (1974-2000)		35,386	720,011	211,707	6,361	0.0296	0.7270	0.2360	0.0074	973,465	1.79
	512,698	**All Brood Years (1974-1983)**		58,796	707,358	168,412	2,751	0.0611	0.7401	0.1960	0.0027	937,317	2.20
	293,551	Even Brood Years (1974-1983)		47,125	435,624	134,260	1,623	0.0692	0.7046	0.2238	0.0023	618,632	2.29
	731,845	Odd Brood Years (1974-1983)		70,467	979,092	202,565	3,879	0.0530	0.7756	0.1682	0.0031	1,256,002	2.11
	503,615	**All Brood Years (1984-2000)**		10,417	450,998	206,046	8,117	0.0167	0.6600	0.3107	0.0126	675,579	1.64
	412,142	Even Brood Years (1984-2000)		7,712	355,810	195,936	8,299	0.0182	0.6274	0.3396	0.0148	567,756	1.67
	569,914	Odd Brood Years (1984-2000)		13,461	558,085	217,420	7,912	0.0150	0.6966	0.2783	0.0101	796,879	1.60

[a] The estimated number of salmon returning are based upon annual age composition observed in lower Yukon test nets each year, weighted by test fish CPUE.

[b] Based upon expanded test fish age composition estimates for years in which the test fishery terminated early, both in 1994 and 2000.

[c] Brood year return for 3, 4, and 5 year fish, indicate that production (R/P) from brood year 2001 was at least 8.46. Recruits estimated for incomplete brood year.

[d] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2002 was at least 1.34. Recruits estimated for incomplete brood year.

Appendix Table A17.–Escapement, rebuilding and interim goals for Canadian origin Chinook and fall chum salmon stocks, 1985–2006.

	Canadian Origin Stock Targets					
	Chinook Salmon		Fall Chum Salmon			
Year	Escapement Goal	Stabilization/ Rebuilding	Mainstem Escapement Goal	Stabilization/ Rebuilding	Porcupine Escapement Goal	Porcupine Interim Goal
1985	33,000-43,000					
1986	33,000-43,000					
1987	33,000-43,000		90,000-135,000		50,000-120,000	
1988	33,000-43,000		90,000-135,000		50,000-120,000	
1989	33,000-43,000		90,000-135,000		50,000-120,000	
1990	33,000-43,000	18,000	80,000		50,000-120,000	
1991	33,000-43,000	18,000	80,000		50,000-120,000	
1992	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1993	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1994	33,000-43,000	18,000	80,000	61,000	50,000-120,000	
1995	33,000-43,000	18,000	80,000	80,000	50,000-120,000	
1996	33,000-43,000	28,000	80,000	65,000	50,000-120,000	
1997	33,000-43,000	28,000	80,000	49,000	50,000-120,000	
1998	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
1999	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2000	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2001	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2002	33,000-43,000	28,000	80,000	60,000	50,000-120,000	
2003	33,000-43,000	28,000	80,000	65,000	50,000-120,000	15,000
2004	33,000-43,000	28,000	80,000	65,000	50,000-120,000	13,000
2005	33,000-43,000	28,000	80,000	65,000	50,000-120,000	24,000
2006	33,000-43,000	28,000	80,000	80,000	50,000-120,000	28,000

Appendix Table A18.–June commercial sockeye and chum salmon harvest in South Unimak and Shumagin Islands, all gear combined, by year, 1980–2006.

Year	Sockeye	Chum
1980	3,206,275	508,865
1981	1,820,965	563,947
1982	2,118,701	1,095,044
1983	1,961,569	785,631
1984	1,388,203	337,120
1985	1,791,400	433,829
1986	471,397	351,769
1987	792,964	443,019
1988	756,687	526,711
1989	1,744,505	455,163
1990	1,344,529	518,545
1991	1,548,930	772,705
1992	2,457,856	426,203
1993	2,973,744	532,247
1994	1,461,263	582,165
1995	2,105,321	537,433
1996	1,028,970	359,820
1997	1,628,181	322,325
1998	1,288,725	245,619
1999	1,375,399	245,306
2000	1,251,228	239,357
2001	150,632	48,350
2002	591,106	378,817
2003	453,147	282,438
2004	1,348,073	482,309
2005	1,004,395	427,830
2006	932,291	299,827
Average 86-05	1,288,853	408,907
Average 96-05	1,011,986	303,217

Source: Poetter 2006.

Appendix Table A19.–Exvessel value of the catch in the commercial fisheries off Alaska by species group, 1982–2006, (value in $ millions).

Year	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1982	216.5	310.7	19.9	25.7	211.0	783.8
1983	147.7	320.6	29.8	43.0	188.0	729.1
1984	103.4	343.0	20.4	19.6	239.4	725.8
1985	106.9	389.6	36.9	37.5	260.1	831.0
1986	183.0	404.1	38.4	70.1	268.6	964.2
1987	215.2	473.0	41.7	76.3	336.7	1142.9
1988	235.6	744.9	56.0	66.1	444.6	1547.1
1989	279.2	506.7	18.7	84.4	425.3	1314.3
1990	355.1	546.7	24.0	86.9	474.9	1487.6
1991	301.1	300.1	28.6	91.6	548.3	1269.7
1992	335.1	544.5	27.0	48.0	656.9	1611.5
1993	328.5	391.1	14.1	53.6	425.8	1213.1
1994	321.2	424.4	21.6	84.7	465.2	1317.1
1995	282.9	495.9	39.1	59.5	593.7	1471.1
1996	175.2	346.5	44.8	74.2	541.9	1182.6
1997	172.1	247.8	15.9	106.5	597.7	1141.0
1998	218.7	242.7	10.8	94.1	415.5	981.8
1999	271.2	345.7	14.2	116.9	483.4	1231.4
2000	132.6	275.1	14.0	145.0	369.0	935.7
2001	128.6	229.1	14.0	132.0	632.0	1135.7
2002	150.7	162.5	12.0	129.0	553.0	1007.2
2003	181.6	209.6	12.0	171.0	560.0	1134.2
2004	169.5	272.2	15.3	174.6	564.7	1196.3
2005	147.8	302.7	15.4	169.4	660.5	1295.8
2006 [a]	148.5	308.8	7.7	164.0	758.2	1387.7
			Percentage of Total			
1982	27.6	39.6	2.5	3.3	26.9	100
1983	20.3	44.0	4.1	5.9	25.8	100
1984	14.2	47.3	2.8	2.7	33.0	100
1985	12.9	46.9	4.4	4.5	31.3	100
1986	19.0	41.9	4.0	7.3	27.9	100
1987	18.8	41.4	3.6	6.7	29.5	100
1988	15.2	48.1	3.6	4.3	28.7	100
1989	21.2	38.6	1.4	6.4	32.4	100
1990	23.9	36.8	1.6	5.8	31.9	100
1991	23.7	23.6	2.3	7.2	43.2	100
1992	20.8	33.8	1.7	3.0	40.8	100
1993	27.1	32.2	1.2	4.4	35.1	100
1994	24.4	32.2	1.6	6.4	35.3	100
1995	19.2	33.7	2.7	4.0	40.4	100
1996	14.8	29.3	3.8	6.3	45.8	100
1997	15.1	21.7	1.4	9.3	52.4	100
1998	22.3	24.7	1.1	9.6	42.3	100
1999	22.0	28.1	1.2	9.5	39.3	100
2000	14.2	29.4	1.5	15.5	39.4	100
2001	11.3	20.2	1.2	11.6	55.6	100
2002	15.0	16.1	1.2	12.8	54.9	100
2003	16.0	18.5	1.1	15.1	49.4	100
2004	14.2	22.8	1.3	14.6	47.2	100
2005	11.4	23.4	1.2	13.1	51.0	100
2006 [a]	10.7	22.3	0.6	11.8	54.7	100

[a] Data are preliminary.

Note: The value added by at-sea processing is not included in these estimates of exvessel value. Includes Joint venture and foreign groundfish catch.

Source: National Marine Fisheries Service, Alaska Region; National Marine Fisheries Service Office of the Pacific Marine Fisheries Commission, Pacific Fisheries Information Network, 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115-0070.

Appendix Table A20.–Total groundfish catch and estimated number of Chinook and other salmon caught by the groundfish fisheries off the coast of Alaska, 1990 through 2006.

Year	Groundfish (mt)	Chinook	Chum	Coho	Sockeye	Pink	Total
BSAI							
1990	1,706,379	14,085	16,202	153	30	31	30,501
1991	2,154,903	48,873	29,706	396	79	79	79,133
1992	2,057,849	41,955	40,090	1,266	14	80	83,405
1993	1,854,216	45,964	242,895	321	22	8	289,210
1994	1,958,788	44,380	95,978	231	20	202	140,811
1995	1,928,073	23,079	20,901	858	0	21	44,859
1996	1,847,631	63,205	77,771	218	5	1	141,200
1997	1,824,188	50,218	67,349	114	3	69	117,753
1998	1,615,685	55,427	---65,631---				121,058
1999	1,424,752	12,924	---46,295---				59,219
2000	1,607,549	7,470	---57,600---				65,070
2001	1,813,924	37,734	---57,339---				95,073
2002	1,934,957	37,605	---78,454---				116,059
2003	1,970,817	54,763	---193,981---				248,744
2004	1,978,721	62,459	---447,196---				509,655
2005	1,407,925	74,843	---701,741---				776,584
2006	1,974,920	85,764	---326,296---				412,060
GOA							
1990	244,397	16,913	2,541	1,482	85	64	21,085
1991	269,616	38,894	13,713	1,129	51	57	53,844
1992	269,797	20,462	17,727	86	33	0	38,308
1993	255434	24,465	55,268	306	15	799	80,853
1994	239,503	13,973	40,033	46	103	331	54,486
1995	216,585	14,647	64,067	668	41	16	79,439
1996	202,054	15,761	3,969	194	2	11	19,937
1997	230,448	15,119	3,349	41	7	23	18,539
1998	245,516	16,984	---13,544---				30,528
1999	227,614	30,600	--- 7,530---				38,130
2000	204,398	26,705	--- 10,995---				37,700
2001	182,011	15,104	--- 6,063---				21,167
2002	165,664	12,759	---3,192---				15,951
2003	176,433	15,877	---10,599---				26,475
2004	168,475	17,832	---5,893---				23,725
2005	133,171	31,896	---6,841---				38,737
2006	195,356	17,577	---4,746---				22,323

Source: Berger, 2002 and NMFS Alaska Region Catch Accounting.

Appendix Table A21.–Coded wire tagged Yukon River Chinook salmon recoveries in the US groundfish fisheries.

Brood Year	Location	Release Date	Recovery Date	Latitude	Longitude	Gear Type
1995	Mitchie Cr.	6/11/1997	3/16/2000	55º 56’	168º 52’	Domestic Trawl
1997	Judas Cr.	6/12/1998	3/28/2001	56º 18’	170º 33’	Domestic Trawl
2000	McClintock R.	6/8/2001	2/15/2002	56º 10’	166º 00’	Domestic Trawl
2001	Mitchie Cr.	6/10/2002	10/3/2002	64º 06’	164º 31’	Research Trawl
2001	Wolf Cr.	6/2/2002	10/3/2002	64º 06	164º 31’	Research Trawl
2001	Mitchie Cr.	6/10/2002	10/4/2002	63º 00’	165º 58’	Research Trawl
2001	Mitchie Cr.	6/10/2002	2/8/2003	56º 44’	167º 00’	Domestic Trawl
1988	Mitchie Cr.	6/6/1989	3/25/1992	56º 44’	173º 15’	Domestic Trawl
1990	Wolf Cr.	8/8/1991	3/14/1994	60º 06’	178º 58’	Domestic Trawl
1992	Wolf Cr.	6/6/1993	12/6/1994	56º 52’	171º 18’	Domestic Trawl
1991	Mitchie Cr.	6/4/1992	2/24/1995	55º 19’	164º 43’	Domestic Trawl
1992	Yukon R.	6/15/1993	6/2/1997	59º 29’	167º 49’	Domestic Trawl
1993	Mitchie Cr.	6/1/1994	3/10/1998	59º 26’	178º 05’	Domestic Trawl
1995	Fox Cr.	6/4/1996	3/29/1998	58º 56’	178º 06’	Domestic Trawl
1995	Judas Cr.	6/4/1996	3/30/1999	57º 43’	173º 34’	Domestic Trawl
1999	Wolf Creek	6/10/2000	3/3/2003	56º 26’	169º 55’	Domestic Trawl
1988	McClintock R.	6/6/1989	3/19/2004	Area 513		Domestic Trawl
2001	Mitchie Cr.	6/10/2002	3/15/2005	57º 21’	171º 39’	Domestic Trawl
2001	Wolf Cr.	5/23/2002	10/8/2004	54º 01’	166º 29’	Domestic Trawl

APPENDIX B: TABLES

Appendix Table B1.–Alaskan and Canadian total utilization of Yukon River Chinook, chum and coho salmon, 1903–2006.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total
1903				4,666		4,666	4,666		4,666
1904									
1905									
1906									
1907									
1908				7,000		7,000	7,000		7,000
1909				9,238		9,238	9,238		9,238
1910									
1911									
1912									
1913				12,133		12,133	12,133		12,133
1914				12,573		12,573	12,573		12,573
1915				10,466		10,466	10,466		10,466
1916				9,566		9,566	9,566		9,566
1917									
1918	12,239	1,500,065	1,512,304	7,066		7,066	19,305	1,500,065	1,519,370
1919	104,822	738,790	843,612	1,800		1,800	106,622	738,790	845,412
1920	78,467	1,015,655	1,094,122	12,000		12,000	90,467	1,015,655	1,106,122
1921	69,646	112,098	181,744	10,840		10,840	80,486	112,098	192,584
1922	31,825	330,000	361,825	2,420		2,420	34,245	330,000	364,245
1923	30,893	435,000	465,893	1,833		1,833	32,726	435,000	467,726
1924	27,375	1,130,000	1,157,375	4,560		4,560	31,935	1,130,000	1,161,935
1925	15,000	259,000	274,000	3,900		3,900	18,900	259,000	277,900
1926	20,500	555,000	575,500	4,373		4,373	24,873	555,000	579,873
1927		520,000	520,000	5,366		5,366	5,366	520,000	525,366
1928		670,000	670,000	5,733		5,733	5,733	670,000	675,733
1929		537,000	537,000	5,226		5,226	5,226	537,000	542,226
1930		633,000	633,000	3,660		3,660	3,660	633,000	636,660
1931	26,693	565,000	591,693	3,473		3,473	30,166	565,000	595,166
1932	27,899	1,092,000	1,119,899	4,200		4,200	32,099	1,092,000	1,124,099
1933	28,779	603,000	631,779	3,333		3,333	32,112	603,000	635,112
1934	23,365	474,000	497,365	2,000		2,000	25,365	474,000	499,365
1935	27,665	537,000	564,665	3,466		3,466	31,131	537,000	568,131
1936	43,713	560,000	603,713	3,400		3,400	47,113	560,000	607,113
1937	12,154	346,000	358,154	3,746		3,746	15,900	346,000	361,900
1938	32,971	340,450	373,421	860		860	33,831	340,450	374,281
1939		327,650	355,687	720		720	28,757	327,650	356,407
1940	32,453	1,029,000	1,061,453	1,153		1,153	33,606	1,029,000	1,062,606
1941	47,608	438,000	485,608	2,806		2,806	50,414	438,000	488,414
1942	22,487	197,000	219,487	713		713	23,200	197,000	220,200
1943	27,650	200,000	227,650	609		609	28,259	200,000	228,259
1944	14,232		14,232	986		986	15,218		15,218
1945	19,727		19,727	1,333		1,333	21,060		21,060
1946	22,782		22,782	353		353	23,135		23,135
1947	54,026		54,026	120		120	54,146		54,146
1948	33,842		33,842				33,842		33,842
1949	36,379		36,379				36,379		36,379
1950	41,808		41,808				41,808		41,808
1951	56,278		56,278				56,278		56,278
1952	38,637	10,868	49,505				38,637	10,868	49,505
1953	58,859	385,977	444,836				58,859	385,977	444,836
1954	64,545	14,375	78,920				64,545	14,375	78,920
1955	55,925		55,925				55,925		55,925
1956	62,208	10,743	72,951				62,208	10,743	72,951
1957	63,623		63,623				63,623		63,623
1958	75,625	337,500	413,125	11,000	1,500	12,500	86,625	339,000	425,625
1959	78,370		78,370	8,434	3,098	11,532	86,804	3,098	89,902
1960	67,597		67,597	9,653	15,608	25,261	77,250	15,608	92,858

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Appendix Table B1.–Page 2 of 2.

	Alaska [a, b]			Canada [c]			Total		
		Other			Other			Other	
Year	Chinook	Salmon	Total	Chinook	Salmon	Total	Chinook	Salmon	Total
1961	141,152	461,597	602,749	13,246	9,076	22,322	154,398	470,673	625,071
1962	105,844	434,663	540,507	13,937	9,436	23,373	119,781	444,099	563,880
1963	141,910	429,396	571,306	10,077	27,696	37,773	151,987	457,092	609,079
1964	109,818	504,420	614,238	7,408	12,187	19,595	117,226	516,607	633,833
1965	134,706	484,587	619,293	5,380	11,789	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,192	17,644	109,339	322,694	432,033
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	16,911	23,358	142,638	564,359	706,997
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,135	14,657	104,192	789,293	893,485
1974	118,053	1,229,678	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,883	1,307,037	1,383,920	6,000	20,600	26,600	82,883	1,327,637	1,410,520
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,494	1,090,758	1,205,252	7,527	12,479	20,006	122,021	1,103,237	1,225,258
1978	129,988	1,615,312	1,745,300	5,881	9,566	15,447	135,869	1,624,878	1,760,747
1979	159,232	1,596,133	1,755,365	10,375	22,084	32,459	169,607	1,618,217	1,787,824
1980	197,665	1,730,960	1,928,625	22,846	23,718 [d]	46,564	220,511	1,754,678	1,975,189
1981	188,477	2,097,871	2,286,348	18,109	22,781 [d]	40,890	206,586	2,120,652	2,327,238
1982	152,808	1,265,457	1,418,265	17,208	16,091 [d]	33,299	170,016	1,281,548	1,451,564
1983	198,436	1,678,597	1,877,033	18,952	29,490 [d]	48,442	217,388	1,708,087	1,925,475
1984	162,683	1,548,101	1,710,784	16,795	29,767 [d]	46,562	179,478	1,577,868	1,757,346
1985	187,327	1,657,984	1,845,311	19,301	41,515 [d]	60,816	206,628	1,699,499	1,906,127
1986	146,004	1,758,825	1,904,829	20,364	14,843 [d]	35,207	166,368	1,773,668	1,940,036
1987	188,386	1,246,176	1,434,562	17,614	44,786 [d]	62,400	206,000	1,290,962	1,496,962
1988	148,421	2,311,214	2,459,635	21,427	33,915 [d]	55,342	169,848	2,345,129	2,514,977
1989	157,606	2,281,566	2,439,172	17,944	23,490 [d]	41,434	175,550	2,305,056	2,480,606
1990	149,433	1,053,351	1,202,784	19,227	34,302 [d]	53,529	168,660	1,087,653	1,256,313
1991	154,651	1,335,111	1,489,762	20,607	35,653 [d]	56,260	175,258	1,370,764	1,546,022
1992	168,191	863,575	1,031,766	17,903	21,310 [d]	39,213	186,094	884,885	1,070,979
1993	163,078	342,197	505,275	16,611	14,150 [d]	30,761	179,689	356,347	536,036
1994	172,315	577,233	749,548	21,198	38,342	59,540	193,513	615,575	809,088
1995	177,663	1,437,837	1,615,500	20,884	46,109	66,993	198,547	1,483,946	1,682,493
1996	138,562	1,121,181	1,259,743	19,612	24,395	44,007	158,174	1,145,576	1,303,750
1997	174,625	544,879	719,504	16,528	15,880	32,408	191,153	560,759	751,912
1998	99,369	199,735	299,104	5,937 [e]	8,115	14,052	105,306	207,850	313,156
1999	124,315	234,221	358,536	12,468	19,606	32,074	136,783	253,827	390,610
2000	45,308	106,936	152,244	4,879 [f]	9,273	14,152	50,187	116,209	166,396
2001	53,738	116,477	170,215	10,139	9,882	20,021	63,877	126,359	190,236
2002	68,112	122,350	190,462	9,257	8,493	17,750	77,369	130,843	208,212
2003	98,696	199,798	298,494	9,616	11,885	21,501	108,312	211,683	319,995
2004	111,557	205,264	316,821	11,238	9,930	21,168	122,795	215,194	337,989
2005	85,509	478,209	563,718	11,074	18,335	29,409	96,583	496,544	593,127
2006 [g,h]	99,361	477,190	576,551	8,925	11,908	20,833	108,286	489,098	597,384
Average									
1903-05	91,035	741,196	726,304	8,749	18,039	18,935	87,659	733,291	689,729
1996-05	99,979	332,905	432,884	11,075	13,579	24,654	111,054	346,484	457,538
2001-05	83,522	224,420	307,942	10,265	11,705	21,970	93,787	236,125	329,912

[a] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe.
[b] Commercial, subsistence, personal-use, test fish retained for subsistence, and sport catches combined. Totals do not include the Coastal District communities of Hooper Bay and Scammon Bay.
[c] Catch in number of salmon. Commercial, Aboriginal, domestic and sport catches combined.
[d] Includes the Old Crow Aboriginal fishery harvest of coho salmon.
[e] Catch includes 761 Chinook salmon taken in the mark–recapture test fishery.
[f] Catch includes 737 Chinook salmon taken in the test fishery.
[g] Data are preliminary.
[h] Subsistence, Personal Use and Sport Fish harvest data are unavailable at this time.

Appendix Table B2.–Alaskan catch of Yukon River Chinook salmon, 1961–2006.

Year	Commercial	Commercial Related	Total Commercial	Subsistence [a]	Personal Use	Test Fish [b]	Sport Fish [c]	Total
1961	119,664	0	119,664	21,488				141,152
1962	94,734	0	94,734	11,110				105,844
1963	117,048	0	117,048	24,862				141,910
1964	93,587	0	93,587	16,231				109,818
1965	118,098	0	118,098	16,608				134,706
1966	93,315	0	93,315	11,572				104,887
1967	129,656	0	129,656	16,448				146,104
1968	106,526	0	106,526	12,106				118,632
1969	91,027	0	91,027	14,000				105,027
1970	79,145	0	79,145	13,874				93,019
1971	110,507	0	110,507	25,684				136,191
1972	92,840	0	92,840	20,258				113,098
1973	75,353	0	75,353	24,317				99,670
1974	98,089	0	98,089	19,964				118,053
1975	63,838	0	63,838	13,045				76,883
1976	87,776	0	87,776	17,806				105,582
1977	96,757	0	96,757	17,581			156	114,494
1978	99,168	0	99,168	30,785			523	130,476
1979	127,673	0	127,673	31,005			554	159,232
1980	153,985	0	153,985	42,724			956	197,665
1981	158,018	0	158,018	29,690			769	188,477
1982	123,644	0	123,644	28,158			1,006	152,808
1983	147,910	0	147,910	49,478			1,048	198,436
1984	119,904	0	119,904	42,428			351	162,683
1985	146,188	0	146,188	39,771			1,368	187,327
1986	99,970	0	99,970	45,238			796	146,004
1987	134,760	0	134,760 [d]	55,039	1,706		502	192,007
1988	100,364	0	100,364	45,495	2,125	1,081	944	150,009
1989	104,198	0	104,198	48,462	2,616	1,293	1,053	157,622
1990	95,247	413	95,660	48,587	2,594	2,048	544	149,433
1991	104,878	1,538	106,416	46,773		689	773	154,651
1992	120,245	927	121,172	47,077		962	431	169,642
1993	93,550	560	94,110	63,915	426	1,572	1,695	161,718
1994	113,137	703	113,840	53,902		1,631	2,281	171,654
1995	122,728	1,324	124,052	50,620	399	2,152	2,525	179,748
1996	89,671	521	90,192	45,671	215	1,698	3,151	140,927
1997	112,841	769	113,610	57,117	313	2,811	1,913	175,764
1998	43,618	81	43,699	54,124	357	926	654	99,760
1999	69,275	288	69,563	53,305	331	1,205	1,023	125,427
2000	8,518		8,518	36,404	75	597	276	45,870
2001				55,819	122		679	56,620
2002	24,128		24,128	43,742	126	528	486	69,010
2003	40,438		40,438	56,959	204	680	2,719	101,000
2004	56,151		56,151	55,713	201	792	1,513	114,370
2005	32,029		32,029	53,409	138	310	483	86,369
2006 [e]	45,829		45,829	53,128 [f]	158 [f]	841	1,176 [f]	101,132
1989-1998 Average	100,011	684	100,695	51,625	989	1,578	1,502	156,092
Average								
2001-2005	38,187		38,187	53,128	158	578	1,176	85,474
2002-2006	39,715		39,715	52,590	165	630	1,275	94,376

[a] Includes salmon harvested for subsistence, and an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990.

[b] Includes only test fish that were sold commercially.

[c] Sport fish harvest for the Alaskan portion of the Yukon River drainage. Most of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993: 1992 Yukon Area AMR).

[d] Includes 653 and 2,136 Chinook salmon illegally sold in District 5 and 6 (Tanana River), respectively.

[e] Data are preliminary.

[f] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix Table B3.–Alaska catch of Yukon River summer chum salmon, 1961–2006.

Year	Subsistence [a]	Commercial	Commercial Related	Personal Use	Test Fish [b]	Sport Fish [c]	Total
1970	166,504	137,006	0				303,510
1971	171,487	100,090	0				271,577
1972	108,006	135,668	0				243,674
1973	161,012	285,509	0				446,521
1974	227,811	589,892	0				817,703
1975	211,888	710,295	0				922,183
1976	186,872	600,894	0				787,766
1977	159,502	534,875	0			316	694,693
1978	171,383	1,052,226	25,761			451	1,249,821
1979	155,970	779,316	40,217			328	975,831
1980	272,398	928,609	139,106			483	1,340,596
1981	208,284	1,006,938	272,763	0		612	1,488,597
1982	260,969	461,403	255,610	0		780	978,762
1983	240,386	744,879	250,590	0		998	1,236,853
1984	230,747	588,597	277,443	0		585	1,097,372
1985	264,828	516,997	417,016	0		1,267	1,200,108
1986	290,825	721,469	467,381	0		895	1,480,570
1987	300,042	442,238	180,303	4,262		846	927,691
1988	229,838	1,148,650	468,032	2,225	3,587	1,037	1,853,369
1989	169,496	955,806	496,934	1,891	10,605	2,132	1,636,864
1990	115,609	302,625	214,552	1,827	8,263	472	643,348
1991	118,540	349,113	308,989	0	3,934	1,037	781,613
1992	142,192	332,313	211,264	0	1,967	1,308	689,044
1993	125,574	96,522	43,594	674	1,869	564	268,797
1994	124,807	80,284	178,457	0	3,212	350	387,110
1995	136,083	259,774	558,640	780	6,073	1,174	962,524
1996	124,738	147,127	535,106	905	7,309	1,854	817,039
1997	112,820	95,242	133,010	391	2,590	475	344,528
1998	87,366	28,611	187	84	3,019	421	119,688
1999	83,784	29,389	24	382	836	555	114,970
2000	78,072	6,624	0	30	648	161	85,535
2001	72,301	0	0	146	0	82	72,529
2002	87,056	13,558	19	175	218	384	101,410
2003	82,272	10,685	0	148	119	1,603	94,827
2004	77,934	26,410	0	231	217	203	104,995
2005	93,259	41,264	0	152	134	435	135,244
2006 [d]	82,564	92,116	0	170	502	541	175,894
2001-2005 Average	82,564	18,383	4	170	138	541	101,801
1996-2005 Average	89,960	39,891	66,835	264	1,509	617	199,077

[a] Includes harvest from the Coastal District and test fish harvest that were utilized for subsistence.
[b] Includes only test fish that were sold commercially.
[c] Sport fish harvest is assumed to be primarily summer chum salmon caught incidental to directed Chinook fishing.
[d] Data are preliminary. Subsistence and Sport Fish are represented by the recent 5-year average.

Appendix Table B4.–Alaskan catch of Yukon River fall chum salmon, 1961–2006.

Year	Estimated Subsistence Use [a]	Harvest		
		Subsistence [b]	Commercial [c]	Total [d]
1961	101,772 [f, g]	101,772	42,461	144,233
1962	87,285 [f, g]	87,285	53,116	140,401
1963	99,031 [f, g]	99,031		99,031
1964	120,360 [f, g]	120,360	8,347	128,707
1965	112,283 [f, g]	112,283	23,317	135,600
1966	51,503 [f, g]	51,503	71,045	122,548
1967	68,744 [f, g]	68,744	38,274	107,018
1968	44,627 [f, g]	44,627	52,925	97,552
1969	52,063 [f, g]	52,063	131,310	183,373
1970	55,501 [f, g]	55,501	209,595	265,096
1971	57,162 [f, g]	57,162	189,594	246,756
1972	36,002 [f, g]	36,002	152,176	188,178
1973	53,670 [f, g]	53,670	232,090	285,760
1974	93,776 [f, g]	93,776	289,776	383,552
1975	86,591 [f, g]	86,591	275,009	361,600
1976	72,327 [f, g]	72,327	156,390	228,717
1977	82,771 [g]	82,771 [g]	257,986	340,757
1978	94,867 [g]	84,239 [g]	247,011	331,250
1979	233,347	214,881	378,412	593,293
1980	172,657	167,637	298,450	466,087
1981	188,525	177,240	477,736	654,976
1982	132,897	132,092	224,992	357,084
1983	192,928	187,864	307,662	495,526
1984	174,823	172,495	210,560	383,055
1985	206,472	203,947	270,269	474,216
1986	164,043	163,466	140,019	303,485
1987	361,663	361,663 [h]		361,663
1988	158,694	155,467	164,210	319,677
1989	230,978	216,229	301,928	518,157
1990	185,244	173,076	143,402	316,478
1991	168,890	145,524	258,154	403,678
1992	110,903	107,602	20,429 [j]	128,031
1993	76,925	76,925		76,925
1994	127,586	123,218	7,999	131,217
1995	163,693	131,369	284,178	415,547
1996	146,154	129,222	107,347	236,569
1997	96,899	95,425	59,054	154,479
1998	62,869	62,869		62,869
1999	89,999	89,998	20,371	110,369

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Year	Estimated Subsistence Use [a]	Harvest: Subsistence [b]	Harvest: Commercial [c]	Harvest: Total [d]
2000	19,307	19,307		19,307
2001	35,154	35,154		35,154
2002	19,393	19,393		19,393
2003	57,178	57,178	10,996	68,174
2004	62,436 [m]	62,436 [m]	4,110	66,546
2005	91,597 [m]	91,597 [m]	178,987	269,327
2006 [m]	[k]	[k]	174,542	174,542
Average				
1961-05	113,369	109,622	165,781	249,587
1996-05	68,099	66,258	63,478	104,219
2001-05	53,152	53,152	64,698	91,719

[a] Includes salmon harvested for subsistence and personal use purposes, and an estimate of number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990.

[b] Includes salmon harvested for subsistence and personal use.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[d] Does not include sport-fish harvest. The majority of the sport-fish harvest is believed to be taken in the Tanana River drainage. Sport fish division does not differentiate between the two races of chum salmon. However, most of this harvest is believed to be summer chum salmon.

[f] Catches estimated because harvest of species other than Chinook salmon were not differentiated.

[g] Minimum estimates because surveys were conducted prior to the end of the fishing season.

[h] Includes an estimated 95,768 and 119,168 fall chum salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[j] Commercial fishery operated only in District 6, the Tanana River.

[k] Data are unavailable at this time.

[m] Data are preliminary.

Appendix Table B5.–Alaskan catch of Yukon River coho salmon, 1961–2006.

Year	Estimated Subsistence Use [a]	Harvest Subsistence [b]	Commercial [c]	Sport [d]	Total
1961	9,192 [f, g]	9,192 [f, g]	2,855		12,047
1962	9,480 [f, g]	9,480 [f, g]	22,926		32,406
1963	27,699 [f, g]	27,699 [f, g]	5,572		33,271
1964	12,187 [f, g]	12,187 [f, g]	2,446		14,633
1965	11,789 [f, g]	11,789 [f, g]	350		12,139
1966	13,192 [f, g]	13,192 [f, g]	19,254		32,446
1967	17,164 [f, g]	17,164 [f, g]	11,047		28,211
1968	11,613 [f, g]	11,613 [f, g]	13,303		24,916
1969	7,776 [f, g]	7,776 [f, g]	15,093		22,869
1970	3,966 [f, g]	3,966 [f, g]	13,188		17,154
1971	16,912 [f, g]	16,912 [f, g]	12,203		29,115
1972	7,532 [f, g]	7,532 [f, g]	22,233		29,765
1973	10,236 [f, g]	10,236 [f, g]	36,641		46,877
1974	11,646 [f, g]	11,646 [f, g]	16,777		28,423
1975	20,708 [f, g]	20,708 [f, g]	2,546		23,254
1976	5,241 [f, g]	5,241 [f, g]	5,184		10,425
1977	16,333 [g]	16,333 [g]	38,863	112	55,308
1978	7,787 [g]	7,787 [g]	26,152	302	34,241
1979	9,794	9,794	17,165	50	27,009
1980	20,158	20,158	8,745	67	28,970
1981	21,228	21,228	23,680	45	44,953
1982	35,894	35,894	37,176	97	73,167
1983	23,905	23,905	13,320	199	37,424
1984	49,020	49,020	81,940	831	131,791
1985	32,264	32,264	57,672	808	90,744
1986	34,468	34,468	47,255	1,535	83,258
1987	84,894	84,894 [h]		1,292	86,186
1988	69,080	69,080	99,907	2,420	171,407
1989	41,583	41,583	85,493	1,811	128,887
1990	47,896	44,641	46,937	1,947	93,525
1991	40,894	37,388	109,657	2,775	149,820
1992	53,344	51,921	9,608 [j]	1,666	63,195
1993	15,772	15,772		897	16,669
1994	48,926	44,594	4,451	2,174	51,219
1995	29,716	28,642	47,206	1,278	77,126
1996	33,651	30,510	57,710	1,588	89,808
1997	24,579	24,295	35,818	1,470	61,583
1998	17,781	17,781	1	758	18,540
1999	20,970	20,970	1,601	609	23,180
2000	14,717	14,717		554	15,271
2001	21,654	21,654		1,248	22,856
2002	15,261	15,261		1,092	16,353
2003	24,129	24,129	25,243	1,477	50,849
2004	20,965 [m]	20,965 [m]	19,993	1,623	40,958
2005	27,078 [m]	27,078 [m]	58,311	627	85,389
2006 [m]	[k]	[k]	64,942	[k]	64,942
Average					
1961-05	24,740	24,344	28,799	1,081	49,597
1996-05	22,342	21,892	26,796	1,105	41,652
2001-05	19,345	19,345	22,618	1,213	29,257

[a] Includes salmon harvested for subsistence and personal use purposes, and an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990.

[b] Includes salmon harvested for subsistence and personal use.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993: 1992 Yukon Area AMR).

[f] Catches estimated because harvest of species other than Chinook were not differentiated.

[g] Minimum estimates because surveys were conducted before the end of the fishing season.

[h] Includes an estimated 5,015 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[j] Commercial fishery operated only in District 6, the Tanana River.

[k] Data are unavailable at this time.

[m] Data are preliminary.

Appendix Table B6.–Alaskan and Canadian total utilization of Yukon River Chinook and fall chum salmon, 1961–2006.

	Chinook			Fall Chum		
Year	Canada [a]	Alaska [b, c]	Total	Canada [a]	Alaska [b, c]	Total
1961	13,246	141,152	154,398	9,076	144,233	153,309
1962	13,937	105,844	119,781	9,436	140,401	149,837
1963	10,077	141,910	151,987	27,696	99,031 [d]	126,727
1964	7,408	109,818	117,226	12,187	128,707	140,894
1965	5,380	134,706	140,086	11,789	135,600	147,389
1966	4,452	104,887	109,339	13,192	122,548	135,740
1967	5,150	146,104	151,254	16,961	107,018	123,979
1968	5,042	118,632	123,674	11,633	97,552	109,185
1969	2,624	105,027	107,651	7,776	183,373	191,149
1970	4,663	93,019	97,682	3,711	265,096	268,807
1971	6,447	136,191	142,638	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,522	99,670	104,192	10,135	285,760	295,895
1974	5,631	118,053	123,684	11,646	383,552	395,198
1975	6,000	76,883	82,883	20,600	361,600	382,200
1976	5,025	105,582	110,607	5,200	228,717	233,917
1977	7,527	114,494	122,021	12,479	340,757	353,236
1978	5,881	129,988	135,869	9,566	331,250	340,816
1979	10,375	159,232	169,607	22,084	593,293	615,377
1980	22,846	197,665	220,511	22,218	466,087	488,305
1981	18,109	188,477	206,586	22,281	654,976	677,257
1982	17,208	152,808	170,016	16,091	357,084	373,175
1983	18,952	198,436	217,388	29,490	495,526	525,016
1984	16,795	162,683	179,478	29,267	383,055	412,322
1985	19,301	187,327	206,628	41,265	474,216	515,481
1986	20,364	146,004	166,368	14,543	303,485	318,028
1987	17,614	188,386	206,000	44,480	361,663 [d]	406,143
1988	21,427	148,421	169,848	33,565	319,677	353,242
1989	17,944	157,606	175,550	23,020	518,157	541,177
1990	19,227	149,433	168,660	33,622	316,478	350,100
1991	20,607	154,651	175,258	35,418	403,678	439,096
1992	17,903	168,191	186,094	20,815	128,031 [e]	148,846
1993	16,611	163,078	179,689	14,090	76,925 [d]	91,015
1994	21,198	172,315	193,513	38,008	131,217	169,225
1995	20,884	177,663	198,547	45,600	415,547	461,147
1996	19,612	138,562	158,174	24,354	236,569	260,923
1997	16,528	174,625	191,153	15,580	154,479	170,059
1998	5,937	99,369	105,306	7,901	62,869	70,770
1999	12,468	124,315	136,783	19,506	110,369	129,875
2000	4,879	45,308	50,187	9,236	19,307	28,543
2001	10,139	53,738	63,877	9,512	35,154 [d]	44,666
2002	9,257	68,112	77,369	8,018	19,393	27,411
2003	9,616	98,696	108,312	11,355	68,174	79,529
2004	11,238	111,557	122,795	9,750	66,167	75,917
2005	10,680	85,509	96,189	18,324	271,933	290,257
2006 [f]	8,611	99,361	107,972	11,796	227,694	239,490
Average						
1961-05	12,144	132,605	144,749	18,598	249,636	268,235
1996-05	11,035	99,979	111,015	13,354	104,441	117,795
2001-05	10,186	83,522	93,708	11,392	92,164	103,556

Note: Canadian managers do not refer to chum as fall chum.

[a] Catches in number of salmon. Includes commercial, Aboriginal, domestic, and sport catches combined.

[b] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[c] Commercial, subsistence, personal-use, and sport catches combined.

[d] Commercial fishery did not operate within the Alaskan portion of the drainage.

[e] Commercial fishery operated only in District 6, the Tanana River.

[f] Data are preliminary.

Appendix Table B7.–Canadian catch of Yukon River Chinook salmon, 1961–2006.

	Mainstem Yukon River Harvest								
Year	Commercial	Domestic	Aboriginal Fishery	Sport [a]	Test Fishery	Combined Non-Commercial	Total	Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
1961	3,446		9,300			9,300	12,746	500	13,246
1962	4,037		9,300			9,300	13,337	600	13,937
1963	2,283		7,750			7,750	10,033	44	10,077
1964	3,208		4,124			4,124	7,332	76	7,408
1965	2,265		3,021			3,021	5,286	94	5,380
1966	1,942		2,445			2,445	4,387	65	4,452
1967	2,187		2,920			2,920	5,107	43	5,150
1968	2,212		2,800			2,800	5,012	30	5,042
1969	1,640		957			957	2,597	27	2,624
1970	2,611		2,044			2,044	4,655	8	4,663
1971	3,178		3,260			3,260	6,438	9	6,447
1972	1,769		3,960			3,960	5,729		5,729
1973	2,199		2,319			2,319	4,518	4	4,522
1974	1,808	406	3,342			3,748	5,556	75	5,631
1975	3,000	400	2,500			2,900	5,900	100	6,000
1976	3,500	500	1,000			1,500	5,000	25	5,025
1977	4,720	531	2,247			2,778	7,498	29	7,527
1978	2,975	421	2,485			2,906	5,881		5,881
1979	6,175	1,200	3,000			4,200	10,375		10,375
1980	9,500	3,500	7,546	300		11,346	20,846	2000	22,846
1981	8,593	237	8,879	300		9,416	18,009	100	18,109
1982	8,640	435	7,433	300		8,168	16,808	400	17,208
1983	13,027	400	5,025	300		5,725	18,752	200	18,952
1984	9,885	260	5,850	300		6,410	16,295	500	16,795
1985	12,573	478	5,800	300		6,578	19,151	150	19,301
1986	10,797	342	8,625	300		9,267	20,064	300	20,364
1987	10,864	330	6,069	300		6,699	17,563	51	17,614
1988	13,217	282	7,178	650		8,110	21,327	100	21,427
1989	9,789	400	6,930	300		7,630	17,419	525	17,944
1990	11,324	247	7,109	300		7,656	18,980	247	19,227
1991	10,906	227	9,011	300		9,538	20,444	163	20,607
1992	10,877	277	6,349	300		6,926	17,803	100	17,903
1993	10,350	243	5,576	300		6,119	16,469	142	16,611
1994	12,028	373	8,069	300		8,742	20,770	428	21,198
1995	11,146	300	7,942	700		8,942	20,088	796	20,884
1996	10,164	141	8,451	790		9,382	19,546	66	19,612
1997	5,311	288	8,888	1,230		10,406	15,717	811	16,528
1998	390	24	4,687	0	737	5,448	5,838	99	5,937
1999	3,160	213	8,804	177		9,194	12,354	114	12,468
2000	[b]	[b]	4,068	[b]	761	4,829	4,829	50	4,879
2001	1,351	89	7,416	146	767	8,418	9,769	370	10,139
2002	708	59	7,138	128	1,036	8,361	9,069	188	9,257
2003	2,672	115	6,121	275	263	6,774	9,446	173	9,619
2004	3,785	88	6,483	423	167	7,161	10,946	292	11,238
2005	4,066	65	6,376	173		6,614	10,680	394	11,074
2006 [c]	2,332	63	5,757	606		6,426	8,758	314	9,072
Average									
1961-05	5,915	415	5,569	356	622	6,135	11,919	250	12,152
1996-05	3,512	120	6,843	371	622	7,659	10,819	256	11,075
2001-05	2,516	83	6,707	229	558	7,466	9,982	283	10,265

[a] Sport fish harvest unknown before 1980.
[b] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.
[c] Data are preliminary.

Appendix Table B8.–Canadian catch of Yukon River fall chum salmon, 1961–2006.

	Mainstem Yukon River Harvest						Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
Year	Commercial	Domestic	Test	Aboriginal Fishery	Combined Non-Commercial	Total		
1961	3,276			3,800	3,800	7,076	2,000	9,076
1962	936			6,500	6,500	7,436	2,000	9,436
1963	2,196			5,500	5,500	7,696	20,000	27,696
1964	1,929			4,200	4,200	6,129	6,058	12,187
1965	2,071			2,183	2,183	4,254	7,535	11,789
1966	3,157			1,430	1,430	4,587	8,605	13,192
1967	3,343			1,850	1,850	5,193	11,768	16,961
1968	453			1,180	1,180	1,633	10,000	11,633
1969	2,279			2,120	2,120	4,399	3,377	7,776
1970	2,479			612	612	3,091	620	3,711
1971	1,761			150	150	1,911	15,000	16,911
1972	2,532				0	2,532	5,000	7,532
1973	2,806			1,129	1,129	3,935	6,200	10,135
1974	2,544	466		1,636	2,102	4,646	7,000	11,646
1975	2,500	4,600		2,500	7,100	9,600	11,000	20,600
1976	1,000	1,000		100	1,100	2,100	3,100	5,200
1977	3,990	1,499		1,430	2,929	6,919	5,560	12,479
1978	3,356	728		482	1,210	4,566	5,000	9,566
1979	9,084	2,000		11,000	13,000	22,084		22,084
1980	9,000	4,000		3,218	7,218	16,218	6,000	22,218
1981	15,260	1,611		2,410	4,021	19,281	3,000	22,281
1982	11,312	683		3,096	3,779	15,091	1,000	16,091
1983	25,990	300		1,200	1,500	27,490	2,000	29,490
1984	22,932	535		1,800	2,335	25,267	4,000	29,267
1985	35,746	279		1,740	2,019	37,765	3,500	41,265
1986	11,464	222		2,200	2,422	13,886	657	14,543
1987	40,591	132		3,622	3,754	44,345	135	44,480
1988	30,263	349		1,882	2,231	32,494	1,071	33,565
1989	17,549	100		2,462	2,562	20,111	2,909	23,020
1990	27,537			3,675	3,675	31,212	2,410	33,622
1991	31,404			2,438	2,438	33,842	1,576	35,418
1992	18,576			304	304	18,880	1,935	20,815
1993	7,762			4,660	4,660	12,422	1,668	14,090
1994	30,035			5,319	5,319	35,354	2,654	38,008
1995	39,012			1,099	1,099	40,111	5,489	45,600
1996	20,069			1,260	1,260	21,329	3,025	24,354
1997	8,068			1,218	1,218	9,286	6,294	15,580
1998 [b]				1,792	1,792	1,792	6,159	7,951
1999	10,402			3,234	3,234	13,636	6,000	19,636
2000	1,319			2,917	2,917	4,236	5,000	9,236
2001	2,198	3	1 [a]	3,027	3,030	5,228	4,594	9,822
2002	3,065		2,756 [a]	3,093	3,093	6,158	1,860	8,018
2003	9,030		990 [a]	1,943	1,943	10,973	382	11,355
2004	7,365		995 [a]	2,180	2,180	9,545	205	9,750
2005	11,931	13	0 [a]	1,800	1,813	13,744	4,593	18,337
2006	4,096			2,521	2,521	6,617	5,179	11,796
Average								
1961-03	11,435	1,089	1,249	2,557	2,928	14,098	4,837	18,822
1996-05	8,161	8	948	2,246	2,248	9,593	3,811	13,404
1999-03	5,203	3	1,249	2,843	2,843	8,046	3,567	11,613

[a] The chum test fishery is a live-release test fishery.
[b] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.

Appendix Table B9.–Chinook salmon aerial survey indices for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–2006.

	Andreafsky River		Anvik River		Nulato River			
Year	East Fork	West Fork	Drainage Wide Total	Index Area	North Fork	South Fork	Both Forks	Gisasa River
1961	1,003		1,226		376 [a]	167		266 [a]
1962	675 [a]	762 [a]						
1963								
1964	867	705						
1965		344 [a]	650 [a]					
1966	361	303	638					
1967		276 [a]	336 [a]					
1968	380	383	310 [a]					
1969	274 [a]	231 [a]	296 [a]					
1970	665	574 [a]	368					
1971	1,904	1,682						
1972	798	582 [a]	1,198					
1973	825	788	613					
1974		285	471 [a]		55 [a]	23 [a]		161
1975	993	301	730		123	81		385
1976	818	643	1,053		471	177		332
1977	2,008	1,499	1,371		286	201		255
1978	2,487	1,062	1,324		498	422		45 [a]
1979	1,180	1,134	1,484		1,093	414		484
1980	958 [a]	1,500	1,330	1,192	954 [a]	369 [a]		951
1981	2,146 [a]	231 [a]	807 [a]	577 [a]		791		
1982	1,274	851						421
1983			653 [a]	376 [a]	526	480		572
1984	1,573 [a]	1,993	641 [a]	574 [a]				
1985	1,617	2,248	1,051	720	1,600	1,180		735
1986	1,954	3,158	1,118	918	1,452	1,522		1,346
1987	1,608	3,281	1,174	879	1,145	493		731
1988	1,020	1,448	1,805	1,449	1,061	714		797
1989	1,399	1,089	442 [a]	212 [a]				
1990	2,503	1,545	2,347	1,595	568 [a]	430 [a]		884 [a]
1991	1,938	2,544	875 [a]	625 [a]	767	1,253		1,690
1992	1,030 [a]	2,002 [a]	1,536	931	348	231		910
1993	5,855	2,765	1,720	1,526	1,844	1,181		1,573
1994	300 [a]	213 [a]		913 [a]	843	952		2,775
1995	1,635	1,108	1,996	1,147	968	681		410
1996		624	839	709		100		
1997	1,140	1,510	3,979	2,690				144 [a]
1998	1,027	1,249 [a]	709 [a]	648 [a]	507	546		889 [a]
1999	[a]	870 [a]	[a]	950 [a]	[a]	[a]		[a]
2000	1,018	427	1,721	1,394	[a]	[a]		[a]
2001	1,065	570	1,420	1,172	1,116	768		1,298
2002	1,447	917	1,713	1,329	687	897		506
2003	1,116 [a]	1,578	1,100 [a]	973 [a]				
2004	2,879	1,317	3,679	3,475	856	465	1,321	731
2005	1,715	1,492	2,421	2,421	323	230	553	958
2006	590 [a]	824	1,886	1,776	620	672	1,292	843
SEG [b]	960-1,700	640-1,600		1,100-1,700			940-1,900	420-1,100

Note: Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.

[a] Incomplete, poor timing and/or poor survey conditions resulting in minimal or inaccurate counts.

[b] Sustainable Escapement Goal.

Appendix Table B10.–Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1986–2006.

	Andreafsky River		Nulato River Tower	Gisasa River Weir		Chena River w/corrected percent females		Salcha River w/corrected percent females	
Year	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.
1986	1,530	23.3 [a]				9,065	20.0 [d]		35.8
1987	2,011	56.1 [a]				6,404	43.8 [d]	4,771	47.0 [d]
1988	1,339	38.7 [a]				3,346	46.0 [d]	4,562	36.6 [d]
1989		13.6				2,666	38.0 [d]	3,294	46.8 [d]
1990		41.6				5,603	35.0 [d]	10,728	35.4 [d]
1991		33.9				3,025	31.5 [d]	5,608	34.0 [d]
1992		21.2				5,230	27.8 [d]	7,862	27.3 [d]
1993		29.9				12,241	11.9 [a]	10,007	24.2 [a]
1994	7,801	35.5 [b, c]	1,795 [c]	2,888	[c]	11,877	34.9 [a]	18,399	35.2 [a]
1995	5,841	43.7 [b]	1,412	4,023	46.0	9,680	50.3	13,643	42.2 [a]
1996	2,955	41.9 [b]	756	1,952	19.5	7,153	27.0	7,570	26.3
1997	3,186	36.8 [b]	4,766	3,764	26.0	13,390	17.0 [a]	18,514	36.3 [a]
1998	4,011	29.0 [b]	1,536	2,356	16.2	4,745	30.5 [a]	5,027	22.4 [a]
1999	3,347	28.6 [b]	1,932	2,631	26.4	6,485	47.0 [a]	9,198	38.8 [a]
2000	1,344	54.3 [b]	908	2,089	34.4	4,694	20.0 [d]	4,595	29.9 [a]
2001		[c]	[c]	3,052	49.2 [c]	9,696	32.4 [a]	13,328	27.9 [a]
2002	4,896	21.1 [b]	2,696	1,931	20.7	6,967	27.0 [d]	4,644	34.8 [c]
2003	4,383	45.3 [b]	1,716 [c]	1,873	38.1	8,739	34.0 [c]	15,500	31.8 [c,f]
2004	7,912	37.3	[g]	1,774	30.1	9,645	47.0	15,761	47.0
2005	2,239	50.2	[g]	3,111	34.0		[c]	5,988	54.3
2006 [h]	6,463	42.6	[g]	2,851	28.2	2,936	34.0 [c]	10,679	33.0
BEG [j]						2,800-5,700		3,300-6,500	

[a] Tower counts.
[b] Weir counts.
[c] Incomplete count because of late installation, early removal of project or inoperable.
[d] Mark–recapture population estimate.
[f] Expanded counts based on average run timing.
[g] Project did not operate.
[h] Data are preliminary.
[j] Biological Escapement Goals (BEG) established by the Alaska Board of Fisheries, Jan. 2001.

Appendix Table B11.–Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2006.

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a, c]	Nisutlin River [a, d]	Ross River [a, f]	Wolf River [a, g]	Blind Creek	Chandindu River	Whitehorse Fishway: Count	Whitehorse Fishway: Percent Hatchery Contribution	Canadian Mainstem: Border Passage Estimate	Canadian Mainstem: Harvest	Canadian Mainstem: Spawning Escapement Estimate [j]
1961										1,068	0			
1962										1,500	0			
1963										483	0			
1964										595	0			
1965										903	0			
1966		7 [k]								563	0			
1967										533	0			
1968			173 [k]	857 [k]	407 [k]	104 [k]				414	0			
1969			120	286	105					334	0			
1970		100		670	615		71 [k]			625	0			
1971		130	275	275	650		750			856	0			
1972		80	126	415	237		13			391	0			
1973		99	27 [k]	75 [k]	36 [k]					224	0			
1974		192		70 [k]	48 [k]					273	0			
1975		175		153 [k]	249		40 [k]			313	0			
1976		52		86 [k]	102					121	0			
1977		150	408	316 [k]	77					277	0			
1978		200	330	524	375					725	0			
1979		150	489 [k]	632	713		183 [k]			1,184	0			
1980		222	286 [k]	1,436	975		377			1,383	0			
1981		133	670	2,411	1,626	949	395			1,555	0			
1982		73	403	758	578	155	104			473	0	36,598	16,808	19,790
1983	100	264	101 [k]	540	701	43 [k, n]	95			905	0	47,741	18,752	28,989
1984	150	153	434	1,044	832	151 [k]	124			1,042	0	43,911	16,295	27,616
1985	210	190	255	801	409	23 [k]	110			508	0	29,881	19,151	10,730
1986	228	155	54 [k]	745	459 [k]	72 [p]	109			557	0	36,479	20,064	16,415
1987	100	159	468	891	183	180 [k]	35			327	0	30,823	17,563	13,260
1988	204	152	368	765	267	242	66			405	16	44,445	21,327	23,118
1989	88	100	862	1,662	695	433 [p]	146			549	19	42,620	17,419	25,201
1990	83	643	665	1,806	652	457 [k]	188			1,407	24	56,679	18,980	37,699 [q]
1991			326	1,040		250	201 [r]			1,266 [h]	51 [h]	41,187	20,444	20,743 [q]
1992	73	106	494	617	241	423	110 [r]			758 [h]	84 [h]	43,185	17,803	25,382 [q]
1993		183	184	572	339	400	168 [r]			668 [h]	73 [h]	45,027	16,469	28,558 [q]
1994	101 [k]	477	726	1,764	389	506	393 [r]			1,577 [h]	54 [h]	46,680	20,770	25,910 [q]
1995	121	397	781	1,314	274	253 [k]	229 [r]			2,103	57	52,353	20,088	32,265 [q]
1996	150	423	1,150	2,565	719	102 [k]	705 [r]			2,958	35	47,955	19,546	28,409
1997	193	1,198	1,025	1,345	277		322 [r]	957		2,084	24	53,400	15,717	37,683
1998	53	405	361	523	145		66	373	132	777	95	22,588	5,838	16,750
1999		252	495	353	330		131	892	239	1,118	74	23,716 [v]	12,354	11,362

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Appendix Table B11.–Page 2 of 2.

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a,c]	Nisutlin River [a,d]	Ross River [a,f]	Wolf River [a,g]	Blind Creek	Chandindu River	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution	Canadian Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Canadian Mainstem Spawning Escapement Estimate [j]
2000	19 [t]	277 [e]	46	113	20		32		4 [w]	677	69	16,173 [v]	4,829	11,344
2001	39 [t]		1,035	1,020	481		154		129 [m]	988	36	52,207 [v]	9,769	42,438
2002			526	1,149	280		84		[l]	605	39	49,214 [v]	9,069	40,145 [q]
2003			1,658	3,075	687		292	1115	185 [i]	1,443	70	56,929 [v]	9,443	47,486
2004			1,140	762	330		226	792		1,989	76	48,111 [v]	10,946	37,165
2005			1519	952	807	363	260	525		2,632	57	42,245	10,977	31,268
2006 [s]			1381	1140	601		114			1,720	47	36,748	8,758	27,990
Escapement Objective														28,000
Averages														
1961-03	120	235	479	907	434	279	196			872	19	42,265	11,760	30,505
1996-05	91	511	896	1,186	408	232	227			1,527	58	41,254	10,849	30,405
2001-05	39		1,176	1,392	517	363	203			1,531	56	49,741	10,041	35,716

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted.
[b] All foot surveys prior to 1997 except 1978 (boat survey) and 1986 (aerial survey).
[c] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.
[d] One Hundred Mile Creek to Sidney Creek.
[e] Flood conditions caused early termination of this program.
[f] Index area includes Big Timber Creek to Lewis Lake.
[g] Index area includes Wolf Lake to Red River.
[h] Counts and estimated percentages may be biased high. In some or all of these years a number of adipose-clipped fish ascended the fishway, and were counted more than once. These fish would have been released into the fishway as fry between 1989 and 1994, inclusive.
[i] Combination RBW and conduit weir tested and operational from July 10–30.
[j] Estimated total spawning escapement excluding Porcupine River (estimated border escapement minus the Canadian catch).
[k] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts. Estimated spawning escapement from the DFO tagging study for years 1983, and 1985–1989.
[l] RBW tested for 3 weeks.
[m] Conventional weir July 1-September 8, but was breached from July 31-August 7.
[n] Information on area surveyed is unavailable.
[p] Counts are for Big Timber Creek to Sheldon Lake.
[q] Interim escapement objective. Stabilization escapement objective for years 1990–1995 was 18,000 salmon. Rebuilding step escapement objective for 2002 is 25,000 salmon for subsistence and 28,000 salmon for commercial.
[r] Counts are for Wolf Lake to Fish Lake outlet.
[s] Data are preliminary.
[t] Foot survey.
[v] The 1999 to 2004 Chinook border estimates were revised using a stratified "SPAS" analyses.
[w] High water delayed project installation, therefore counts are incomplete.

Appendix Table B12.–Summer chum salmon ground based escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1973–2006.

	East Fork Andreafsky R.		Anvik R. Sonar		Kaltag Crk. Tower	Nulato R. Tower		Gisasa R. Weir		Clear Crk. Weir		Chena R. Tower	Salcha R. Tower
Year	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	No. Fish
1980			492,676	60.7									
1981	147,312	[a]	1,486,182	54.7									
1982	181,352	64.6 [a]	444,581	69.4									
1983	110,608	57.4 [a]	362,912	56.5									
1984	70,125	50.7 [a]	891,028	60.9									
1985		58.1 [b]	1,080,243	55.8									
1986	167,614	55.4 [c]	1,189,602	57.8									
1987	45,221	58.6 [c]	455,876	65.1			44.9						
1988	68,937	49.3 [c]	1,125,449	66.1			60.9						
1989			636,906	65.6									
1990			403,627	51.3									
1991			847,772	57.9									
1992			775,626	56.6									
1993		48.6	517,409	52.0								5,400	5,809
1994	200,981	65.2 [d, b]	1,124,689	59.1	47,295	148,762	47.7 [b]	51,116	[b]			9,984	39,450
1995	172,148	48.9 [d]	1,339,418	40.1	77,193	236,890	55.6	136,886	45.7	116,735	62.1	3,519 [b]	30,784
1996	108,450	51.4 [d]	933,240	47.3	51,269	129,694	51.9	157,589	49.3	100,912	59.0	12,810 [b]	74,827
1997	51,139	[d]	609,118	53.6	48,018	157,975	51.9	31,800		76,454		9,439 [b]	35,741
1998	67,591	57.3 [d]	471,865	55.9	8,113	49,140	64.2	18,228	50.8	212	[b]	5,901 [b]	17,289
1999	32,229	56.4 [d]	437,631	58.1	5,300	30,076	63.0	9,920	53.1	11,283	[b]	9,165 [b]	23,221
2000	22,918	48.2 [d]	196,349	61.6	6,727	24,308	62.6	14,410	49.9	19,376	43.6	3,515	20,516
2001		52.0 [b]	224,058	55.3	[b]		[b]	17,936	50.3 [b]	3,674	32.4	4,773 [b]	14,900
2002	45,019	52.9	462,101	60.2	13,583	72,232	27.0	32,943	47.7	13,150	51.6	1,021 [b]	20,837 [b]
2003	22,603	44.8	251,358	55.3	3,056 [b]	17,814	[b]	24,379	45.9	5,230	40.5	573 [b]	[b]
2004	62,730	51.4	365,691	53.3	5,247		[e]	37,851	44.9	15,661	44.5	15,162 [f]	47,861
2005	20,127	44.0	525,391	48.0	22,093		[e]	172,259	46.3	26,420	45.8	[b]	193,085
2006	101,465	48.6 [f]	599,146	50.7	[e]		[e]	225,225	52.2 [f]	29,166	43.4 [g]	35,109 [b,f]	111,869 [f]
BEG [h]	65-130		350-700										

[a] Sonar count.
[b] Incomplete count caused by late installation and/or early removal of project, or high water events.
[c] Tower count.
[d] Weir count.
[e] Project did not operate.
[f] Data are preliminary.
[g] Videography count.
[h] Biological Escapement Goals (in thousands of fish) established by the Alaska Board of Fisheries, Jan. 2001.

Appendix Table B13.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Alaskan and Canadian portions of the Yukon River Drainage, 1971–2006.

	Alaska							
	Tanana River Drainage					Upper Yukon River Drainage		
Year	Toklat River [b]	Kantishna River Abundance Estimate [c]	Delta River [d]	Bluff Cabin Slough [e]	Upper Tanana River Abundance Estimate [f]	Rampart Rapids Abundance Estimate [g]	Chandalar River [h]	Sheenjek River [j]
1971								
1972			5,384					
1973			10,469					
1974	41,798		5,915					89,966 [x]
1975	92,265		3,734 [y]					173,371 [x]
1976	52,891		6,312 [y]					26,354 [x]
1977	34,887		16,876 [y]					45,544 [x]
1978	37,001		11,136					32,449 [x]
1979	158,336		8,355					91,372 [x]
1980	26,346 [ah]		5,137	3,190 [m]				28,933 [x]
1981	15,623		23,508	6,120 [m]				74,560
1982	3,624		4,235	1,156				31,421
1983	21,869		7,705	12,715				49,392
1984	16,758		12,411	4,017				27,130
1985	22,750		17,276 [y]	2,655 [m]				152,768
1986	17,976		6,703 [y]	3,458			59,313	84,207 [ad]
1987	22,117		21,180	9,395			52,416	153,267 [ad]
1988	13,436		18,024	4,481 [m]			33,619	45,206 [ad]
1989	30,421		21,342 [y]	5,386 [m]			69,161	99,116 [ad]
1990	34,739		8,992 [y]	1,632			78,631	77,750 [ad]
1991	13,347		32,905 [y]	7,198				86,496 [ag]
1992	14,070		8,893 [y]	3,615 [m]				78,808
1993	27,838		19,857	5,550 [m]				42,922
1994	76,057		23,777 [y]	2,277 [m]				150,565
1995	54,513 [ah]		20,587	19,460	268,173		280,999	241,855
1996	18,264		19,758 [y]	7,074 [y]	134,563	654,296	208,170	246,889
1997	14,511		7,705 [y]	5,707 [y]	71,661	369,547	199,874	80,423 [ak]
1998	15,605		7,804 [y]	3,549 [y]	62,384	194,963	75,811	33,058
1999	4,551	27,199	16,534 [y]	7,037 [y]	97,843	189,741	88,662	14,229
2000	8,911	21,450	3,001 [y]	1,595	34,844	[an]	65,894	30,084 [ao]
2001	6,007 [ap]	22,992	8,103 [y]	1,808 [m]	96,556 [aq]	201,766	110,971	53,932
2002	28,519	56,719	11,992 [y]	3,116	109,970	196,186	89,850	31,642
2003	21,492	87,359	22,582 [y]	10,600 [m]	193,418	485,102	214,416	44,047
2004	35,480	76,163	25,073 [y]	10,270 [m]	123,879	618,597 [ar]	136,706	37,878
2005 [am]	17,779 [ah]	96,926	28,132 [y]	11,964 [m]	318,527	1,987,982	496,494	438,253 [ax]
2006		71,135	14,055 [y]		202,669		245,090	160,178 [ax]
BEG [as]	15,000-33,000		6,000-13,000		46,000- [at] 103,000		74,000-152,000	50,000-104,000
Average								
1971-05	31,243	57,493	13,865	5,963	137,438	544,242	141,312	90,434
1996-05	17,112	57,493	15,068	6,272	124,365	544,242	168,685	101,044
2001-05	21,855	68,032	19,176	7,552	168,470	697,927	209,687	121,150

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Appendix Table B13.–Page 2 of 3.

	Canada							
						Canadian Mainstem		
Year	Fishing Branch River [k, m]	Mainstem Yukon River Index [m, n]	Koidern River [m]	Kluane River [m, p]	Teslin River [m, r]	Border Passage Estimate	Harvest	Spawning Escapement Estimate [s]
1971	312,800							
1972	35,125 [t]			198 [v, e]				
1973	15,989 [w]	383		2,500				
1974	31,525 [w]			400				
1975	353,282 [w]	7,671		362 [e]				
1976	36,584			20				
1977	88,400			3,555				
1978	40,800			0 [e]				
1979	119,898			4,640 [e]				
1980	55,268			3,150		39,130	16,218	22,912
1981	57,386 [z]			25,806		66,347	19,281	47,066 [ac]
1982	15,901	1,020 [aa]		5,378		47,049	15,091	31,958
1983	27,200	7,560		8,578 [e]		118,365	27,490	90,875
1984	15,150	2,800 [ab]	1,300	7,200	200	81,900	25,267	56,633 [ac]
1985	56,016 [w]	10,760	1,195	7,538	356	99,775	37,765	62,010
1986	31,723 [w]	825	14	16,686	213	101,826	13,886	87,940
1987	48,956 [w]	6,115	50	12,000		125,121	44,345	80,776
1988	23,597 [w]	1,550	0	6,950	140	69,280	32,494	36,786
1989	43,834 [w]	5,320	40	3,050	210 [v]	55,861	20,111	35,750
1990	35,000 [af]	3,651	1	4,683	739	82,947	31,212	51,735
1991	37,733 [w]	2,426	53	11,675	468	112,303	33,842	78,461
1992	22,517 [w]	4,438	4	3,339	450	67,962	18,880	49,082
1993	28,707 [w]	2,620	0	4,610	555	42,165	12,422	29,743
1994	65,247 [w]	1,429 [v]	20 [v]	10,734	209 [v]	133,712	35,354	98,358
1995	51,971 [w, aj]	4,701	0	16,456	633	198,203	40,111	158,092
1996	77,278 [w]	4,977		14,431	315	143,758	21,329	122,429
1997	26,959 [w]	2,189		3,350	207	94,725	9,286	85,439
1998	13,564 [w]	7,292		7,337	235	48,047	1,742	46,305
1999	12,904 [w]			5,136	19 [v]	72,188 [aw]	13,506	58,682
2000	5,053 [w]	933 [v]		1,442	204	57,978 [aw]	4,236	53,742
2001	21,669 [w]	2,453		4,884	5	38,769 [aw]	4,918	33,851
2002	13,563 [w]	973		7,147	64	104,853 [aw]	6,158	98,695
2003	29,519 [w]	7,982		39,347	390	153,656 [aw]	10,973	142,683
2004	20,274 [w]	3,440		18,982	167	163,625 [aw]	9,545	154,080
2005	121,413 [w]	16,425		34,600	585	451,477	13,744	437,733
2006	30,849 [w]	6,553		18,208	620	217,810	6,617	211,193
EO [av]	50,000-120,000							>80,000
Average								
1971-05	56,937	4,397	223	8,711	303	106,578	19,969	86,608
1996-05	34,220	5,185	--	13,666	219	132,908	9,544	123,364
2001-05	41,288	6,255	--	20,992	242	182,476	9,068	173,408

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Note: Canadian managers refer to summer and fall chum salmon as chum salmon. Latest table revision March 31, 2007.

[b] Expanded total abundance estimates for upper Toklat River index area using stream life curve (SLC) developed with 1987–1993 data. Index area includes Geiger Creek, Sushana River, and mainstem floodplain sloughs from approximately 0.25 mile upstream of roadhouse.

[c] Fall chum salmon abundance estimate for the Kantishna and Toklat River drainages is based on a mark–recapture program. Tag deployment occurs at a fish wheel located near the mouth of the Kantishna River and recaptures are collected at four fish wheels; two located 8 miles upstream of the mouth of the Toklat River (1999–2005) and one fish wheel on the Upper Kantishna River (2000–2002) and two fish wheels in 2003–2006.

[d] Estimates are a total spawner abundance, using migratory time density curves and stream life data, unless otherwise indicated.

[e] Foot survey, unless otherwise indicated.

[f] Fall chum salmon abundance estimate for the upper Tanana River drainage is based on a mark–recapture program. Tag deployment occurs from a fish wheel (two fish wheels in 1995) located just upstream of the Kantishna River and recaptures are collected from one fish wheel (two fish wheels in 1995) located downstream from the village of Nenana.

[g] Fall chum salmon abundance estimate for the upper Yukon River drainage is based on a mark–recapture program. Tag deployment occurs at two fish wheels (one fish wheel in 2004) located at the "Rapids" and recaptures are collected from a fish wheel (two fish wheels in 1996 to 1999) located downstream from the village of Rampart.

[h] Side-scan sonar estimate for 1986–1990, split-beam sonar estimate 1995 to present.

[j] Side-scan sonar estimate beginning in 1981, split-beam sonar estimate 2002 to 2004, DIDSON sonar since 2005.

[k] Located within the Canadian portion of the Porcupine River drainage. Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.

[m] Aerial survey count, unless otherwise indicated.

[n] Index area includes Tatchun Creek to Fort Selkirk.

[p] Index area includes Duke River to end of spawning sloughs below Swede Johnston Creek.

[r] Index area includes Boswell Creek area (5 km below to 5 km above confluence).

[s] Excludes Fishing Branch River escapement (estimated border passage minus Canadian harvest).

[t] Weir installed Sept 22. Estimate consists of weir count of 17,190 after Sept 22, and tagging passage estimate of 17,935 before weir installation.

[v] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

[w] Weir count.

[x] Total escapement estimate using sonar to aerial survey expansion factor of 2.22.

[y] Population estimate generated from replicate foot surveys and stream life data (area under the curve method).

[z] Initial aerial survey count doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[aa] Boat survey.

[ab] Total index area not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.

[ac] Escapement estimate based on mark–recapture program unavailable. Estimate based on assumed average exploitation rate.

[ad] Expanded estimates for period approximating second week August through middle fourth week Sept, using Chandalar River run timing data.

[af] Weir not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000–40,000 fish considering aerial survey timing.

[ag] Total abundance estimates are for the period approximating second week August through middle fourth week of September. Comparative escapement estimates before 1986 are considered more conservative; approximating the period end of August through mid week of September.

[ah] Minimal estimate because of late timing of ground surveys with respect to peak of spawning.

[aj] Incomplete count caused by late installation and/or early removal of project or high water events.

[ak] Data interpolated due to high water from 29 August until 3 September 1997, during buildup to peak passage.

[am] Data are preliminary.

[an] Project ended early, population estimate through 19 August 2000 was 45,021 on average this represents 0.24 percent of the run.

[ao] Project ended early (September 12) because of low water.

[ap] Minimal estimate because Sushana River was breached by the main channel and uncountable.

[aq] Low numbers of tags deployed and recovered resulted in an estimate with an extremely large confidence interval (95% CI +/- 41,072).

[ar] Preliminary estimate for 2004 was 618,597 fall chum salmon with a high standard error (SE 60,714).

[as] Biological Escapement Goal (BEG) ranges recommended to the Board of Fisheries 2001.

[at] The BEG for the Tanana River as a whole is 61,000 to 136,000. However it includes the Toklat plus and the Upper Tanana which was broke out for comparison to the upper Tanana River abundance estimates.

[av] Escapement Objective (EO) based on US/Canada Treaty Obligations, some years stabilization or rebuilding goals are applied.

[aw] 1999 to 2004 border passage estimates were revised using a stratified "SPAS" analysis.

[aw] In addition to the historical right bank count, the left bank was enumerated with DIDSON (right bank count for 2005 and 2006 was 266,963 and 106,397, respectively).

Appendix Table B14.–Coho salmon passage estimates or escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River Drainage, 1972–2006.

			Kantishna River Drainage	Nenana River Drainage				Upper Tanana River Drainage			
Year	East Fork Andreafsky River [a]	Yukon River Mainstem Sonar Estimate [b]	Geiger Creek [c]	Lost Slough	Nenana Mainstem [d]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [e]	Delta Clearwater River Tributaries [f]	Clearwater Lake and Outlet	Richardson Clearwater River [g]
1972								632		417	454 [h]
1973								3,322		551	375
1974				1,388			27	3,954 [h]		560	652
1975				943			956	5,100		1,575 [i]	4 [h]
1976			25 [g,h]	118			281	1,920		1,500 [i]	80 [h]
1977			60	524 [g]		310 [c]	1,167	4,793		730 [i]	327
1978				350		300 [c]	466	4,798		570 [i]	
1979				227			1,987	8,970		1,015 [i]	372
1980			3 [g,h]	499 [g]		1,603 [c]	592	3,946		1,545 [i]	611
1981	1,657 [g]			274		849 [a,j]	1,005	8,563 [k]		459 [g]	550
1982			81			1,436 [a,j]		8,365 [k]			
1983			42	766		1,042 [a]	103	8,019 [k]		253	88
1984			20 [g,h]	2,677		8,826 [a]		11,061		1,368	428
1985			42 [g,h]	1,584		4,470 [a]	2,081	6,842		750	
1986			5	794		1,664 [a]	218 [i]	10,857		1,800	146 [h]
1987			1,175	2,511		2,387 [a]	3,802	22,300		4,225 [i]	
1988	1,913 [l]		159	348		2,046 [a]		21,600		825 [i]	
1989			155			412 [a]	824 [g]	12,600		1,600 [i]	483
1990			211	688	1,308		15 [g]	8,325		2,375 [i]	
1991			427	564	447		52	23,900		3,150 [i]	
1992			77	372			490	3,963		229 [i]	500
1993			138	484	419	666 [a,m]	581	10,875		3,525 [i]	
1994			410	944	1,648	1,317 [a,u]	2,909	62,675	17,565	3,425 [i]	5,800
1995	10,901	100,664	142	4,169	2,218	500 [a]	2,972 [g]	20,100	6,283	3,625 [i]	
1996	8,037		233	2,040	2,171	201 [g,h]	3,666 [i]	14,075	3,300	1,125 [h]	
1997	9,472	105,956	274	1,524 [v]	1,446	[x]	1,996	11,525	2,375	2,775 [i]	
1998	7,193	129,076	157	1,360 [h]	2,771 [h]	[x]	1,413 [w]	11,100	2,775	2,775 [i]	
1999	2,963	60,886	29	1,002 [h]	745 [h]	[x]	662 [h]	10,975	2,805		

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Appendix Table B14.–Page 2 of 2.

Year	East Fork Andreafsky River [a]	Yukon River Mainstem Sonar Estimate [b]	Kantishna River Drainage: Geiger Creek [c]	Nenana River Drainage: Lost Slough	Nenana River Drainage: Nenana Mainstem [d]	Nenana River Drainage: Wood Creek	Nenana River Drainage: Seventeen Mile Slough	Upper Tanana River Drainage: Delta Clearwater River [e]	Upper Tanana River Drainage: Delta Clearwater River Tributaries [f]	Upper Tanana River Drainage: Clearwater Lake and Outlet	Upper Tanana River Drainage: Richardson Clearwater River [g]
2000	8,451	169,392	142	55 [g,h]	68 [g,h]	[x]	879 [g,h]	9,225	2,358	1,025 [i]	2,175
2001	15,896	132,283	578	242	859	699	3,753	46,875	11,982	4,425 [i]	1,531
2002	3,577	117,908	744	0	328	935	1,910	38,625	9,873	5,900	874
2003	8,231	265,119	973	85	658	3,055	4,535	105,850	27,057	8,800	6,232
2004	11,146	199,884	583	220	450	840	3,370	37,950	9,701	2,925	8,626
2005	5,303	184,071	625	430	325 [h]	1,030	3,890	34,293	8,766	2,100	2,024
2006 [y]		131,919		194	160 [h]	634	1,916	16,748	4,281	4,375	
SEG [z]								5,200-17,000 [z]			
Average											
1972-2006	8,288	145,196	278	883	1,001	1,601	1,617	17,563	8,394	2,191	1,540

Note: Latest table revision March 22, 2007. Only peak counts presented. Survey rating is fair to good, unless otherwise noted.

a Weir count, unless otherwise indicated.

b Passage estimates for coho salmon are incomplete. The sonar project is terminated prior to the end of the coho salmon run.

c Foot survey, unless otherwise indicated.

d Index area includes mainstem Nenana River between confluence's of Lost Slough and Teklanika River.

e Boat survey counts of index area (lower 17.5 river miles), unless otherwise indicated.

f Helicopter surveys counted tributaries of the Delta Clearwater River, outside of the normal mainstem index area, from 1994 to 1998, after which an expansion factor was used to estimate the escapement to the areas.

g Aerial survey, fixed wing or helicopter.

h Poor survey.

i Boat Survey.

j Weir was operated at the mouth of Clear Creek (Shores Landing).

k Expanded estimate based on partial survey counts and historic distribution of spawners from 1977 to 1980.

l The West Fork Andreafsky was also surveyed and 830 chum salmon were observed.

m Weir project terminated on October 4, 1993. Weir normally operated until mid to late October.

n Weir project terminated September 27, 1994. Weir normally operated until mid-October.

o Survey of western floodplain only.

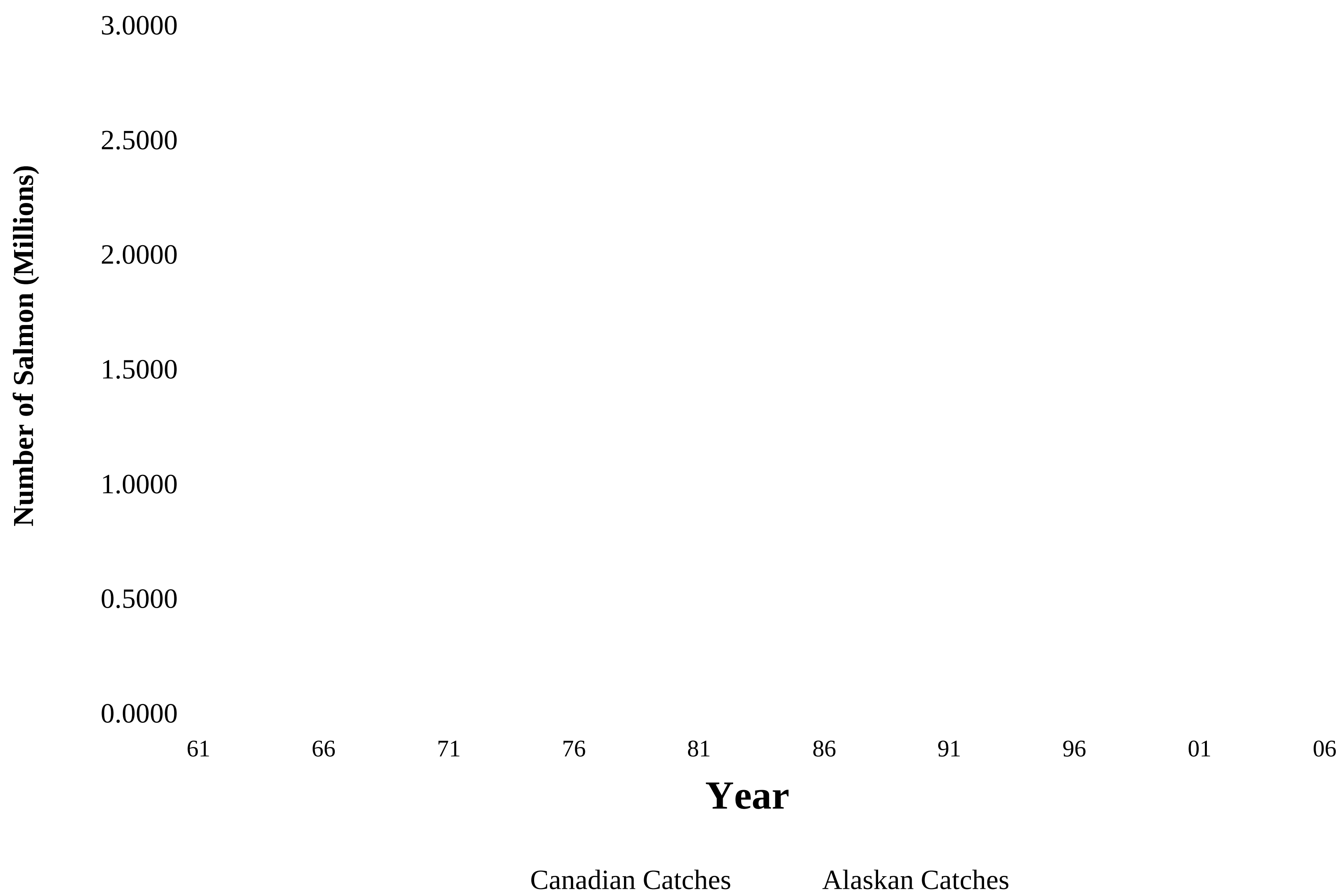
p No survey of Wood Creek due to obstructions in creek.

q Combination foot and boat survey.

r Data preliminary.

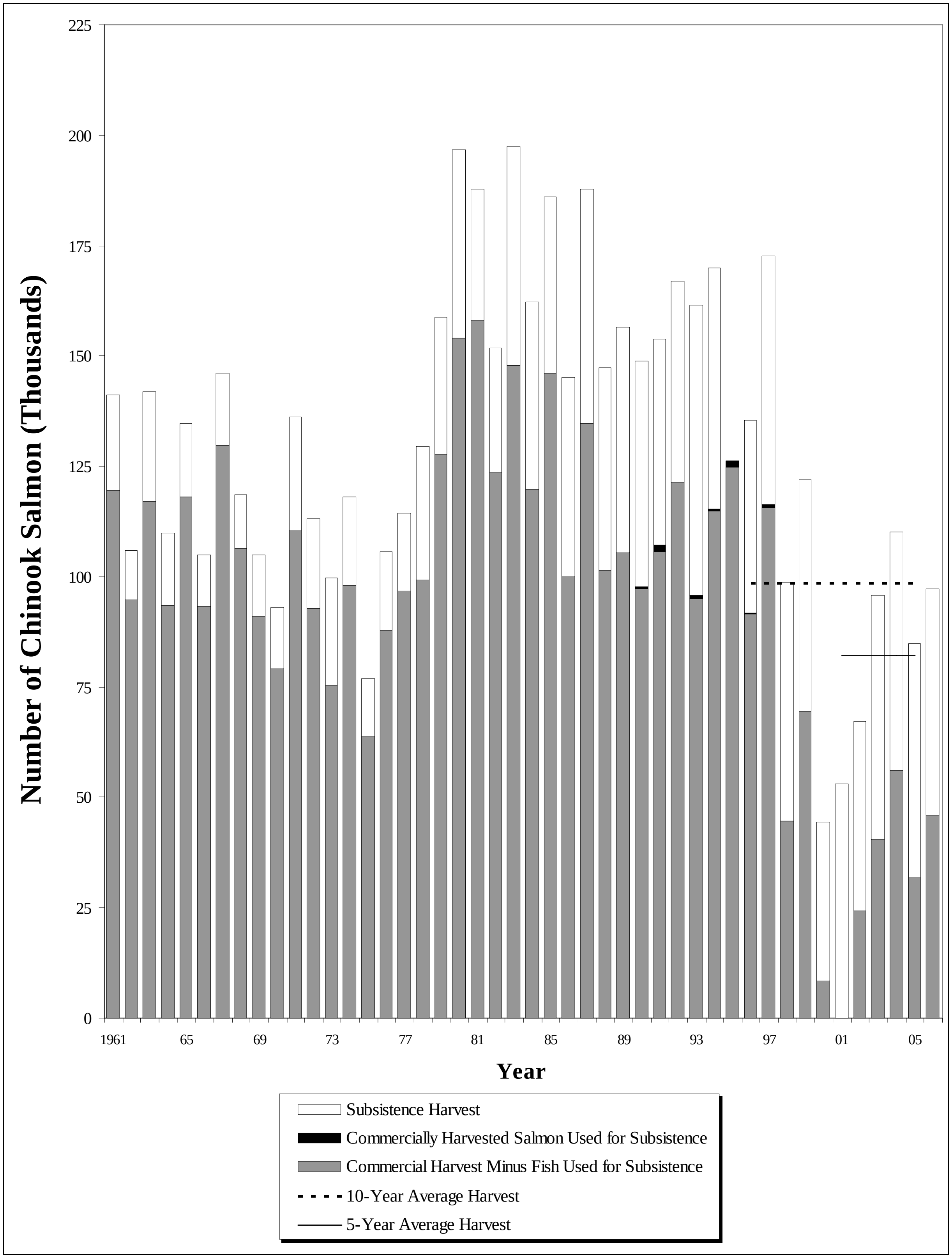
s Sustainable escapement goal (SEG) established January 2004, (replaces BEG of greater than 9,000 fish established March, 1993) based on boat survey counts of coho salmon in the lower 17.5 river miles during the period October 21 through 27.

APPENDIX B: FIGURES



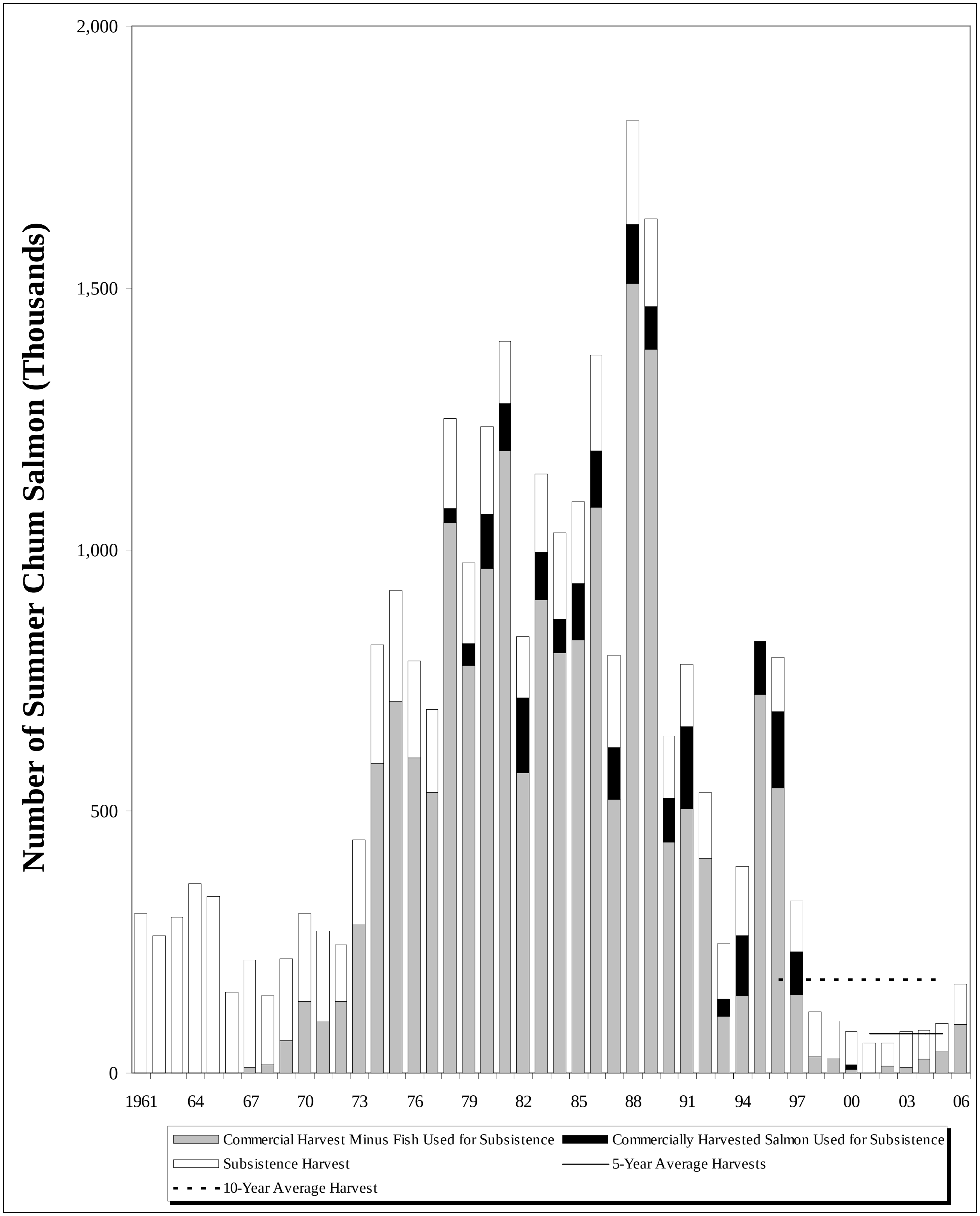
Note: Alaskan harvest estimates other than commercial are unavailable at this time.

Appendix Figure B1.–Total utilization of salmon, Yukon River, 1961–2006.



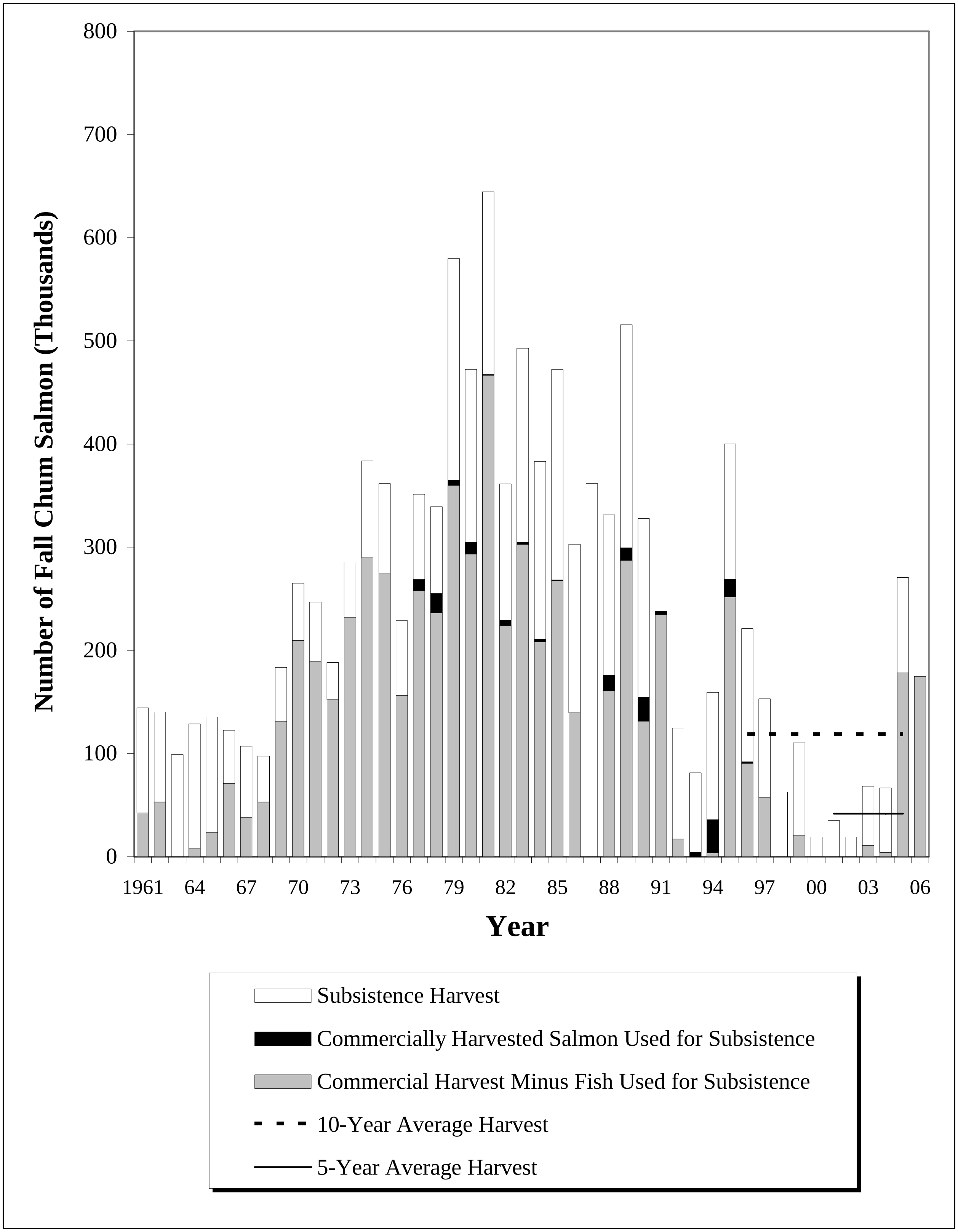
Note: The 2001 commercial fishery was closed. Alaskan harvest estimates other than commercial are preliminary.

Appendix Figure B2.–Alaskan harvest of Chinook salmon, Yukon River, 1961–2006.



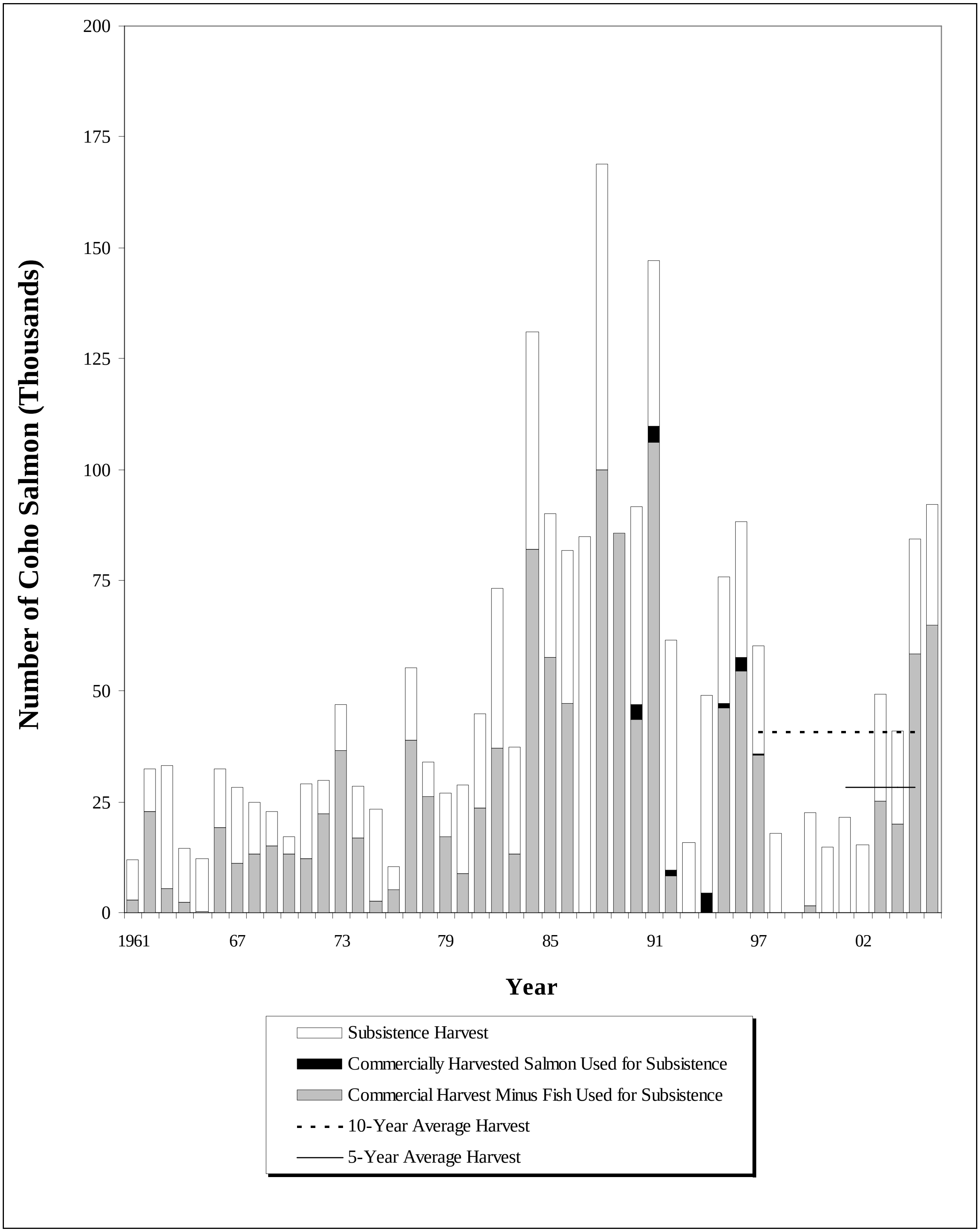
Note: The 2006 harvest estimates other than commercial are preliminary at this time.

Appendix Figure B3.–Alaskan harvest of summer chum salmon 1961–2006.



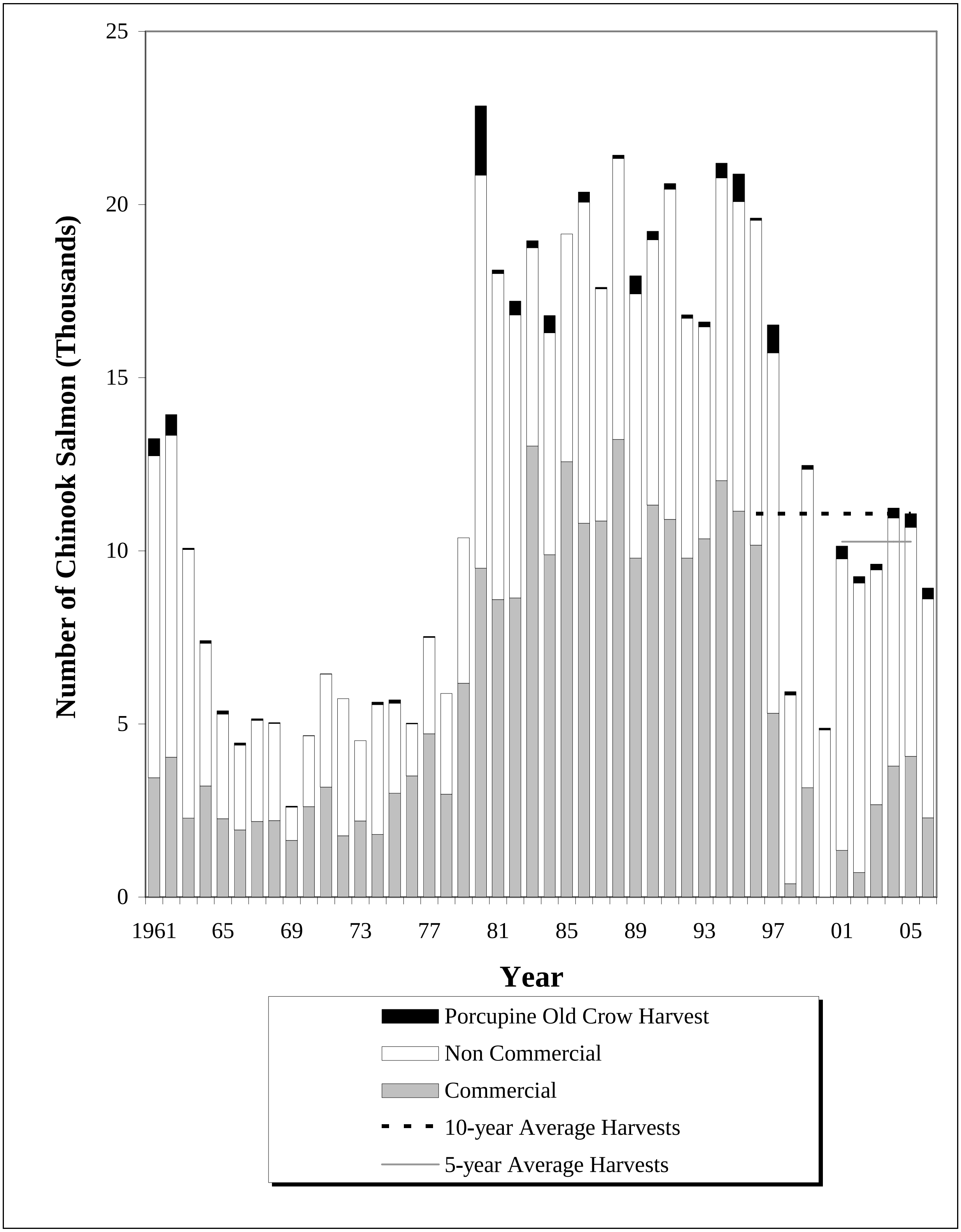
Note: The commercial fishery was closed 2000–2002. The 2006 subsistence harvest estimates are unavailable at this time.

Appendix Figure B4.–Alaskan harvest of fall chum salmon, Yukon River, 1961–2006.



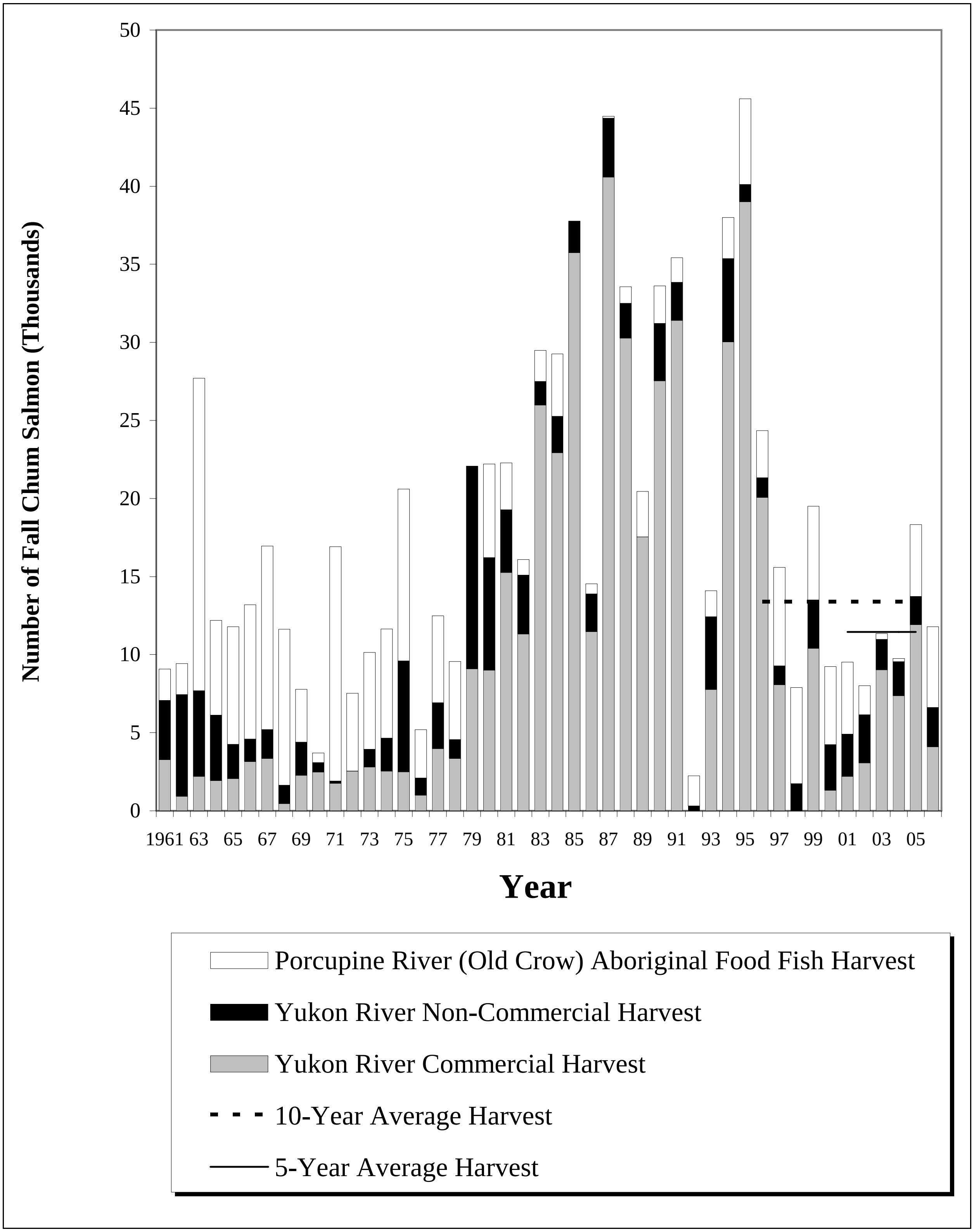
Note: The commercial fishery was closed 2000–2002. The 2006 subsistence harvest estimates are unavailable at this time. Commercial harvest is not adjusted for subsistence use of commercially caught fish.

Appendix Figure B5.–Alaskan harvest of coho salmon, Yukon River, 1961–2006.



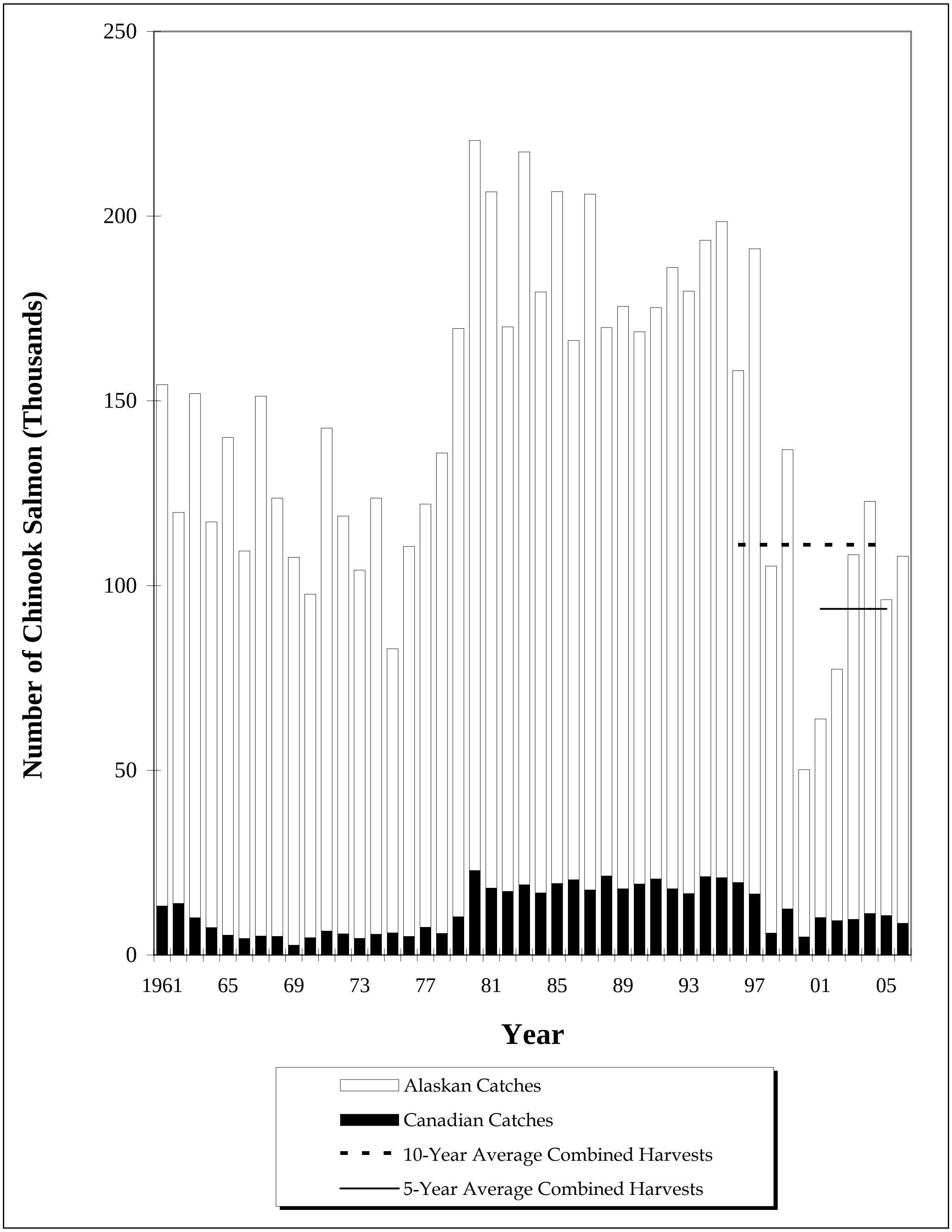
Note: Catch data for 2006 are preliminary.

Appendix Figure B6.–Canadian harvest of Chinook salmon, Yukon River, 1961–2006.



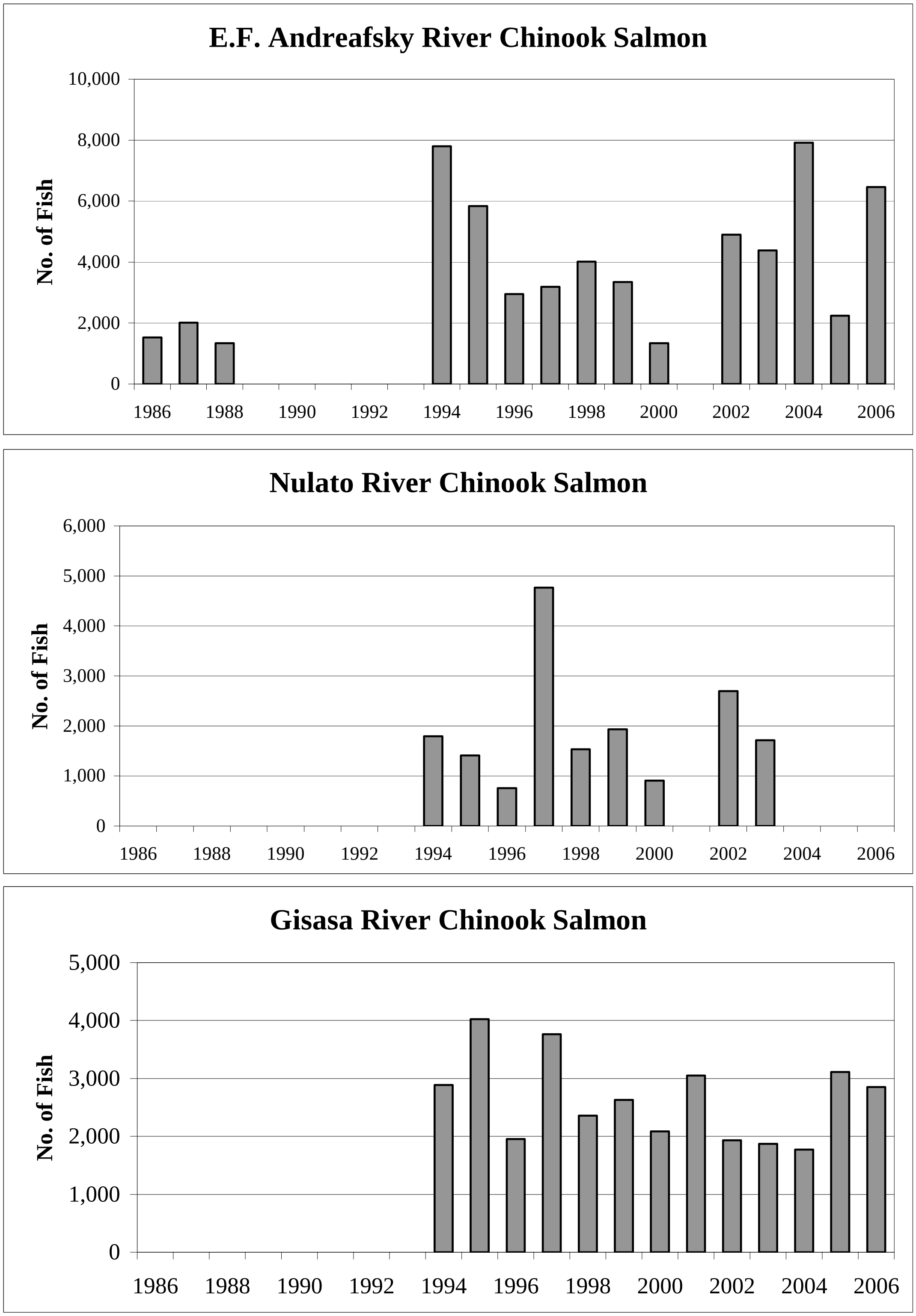
Note: Catch data for 2006 are preliminary.

Appendix Figure B7.–Canadian harvest of fall chum salmon, Yukon River, 1961–2006.



Note: Catch data for 2006 are incomplete and preliminary.

Appendix Figure B8.–Total utilization of Chinook salmon, Yukon River, 1961–2006.

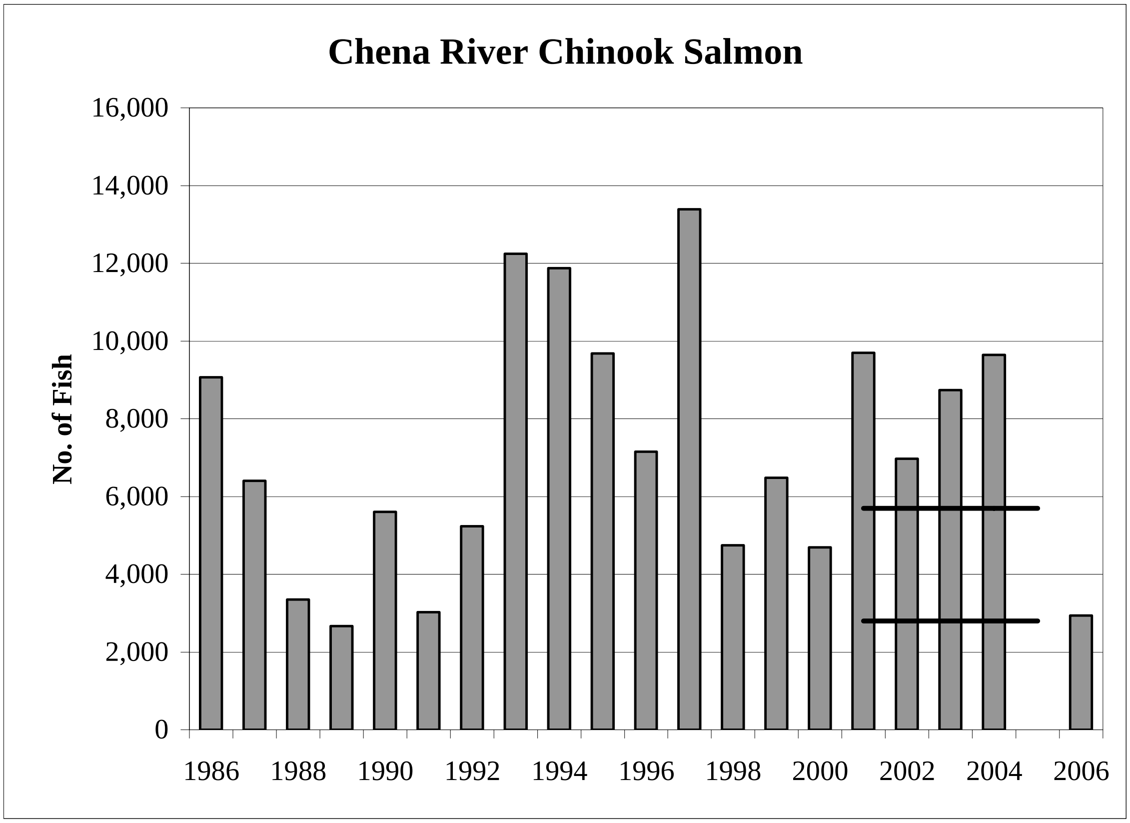


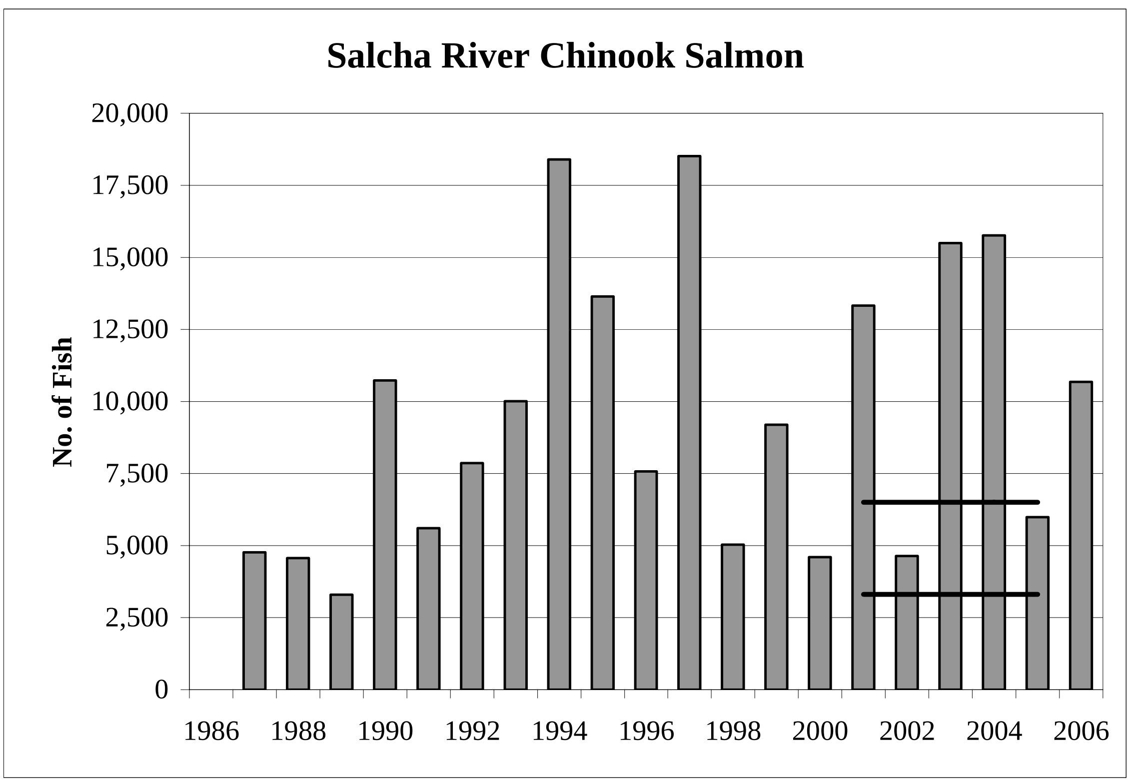
Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

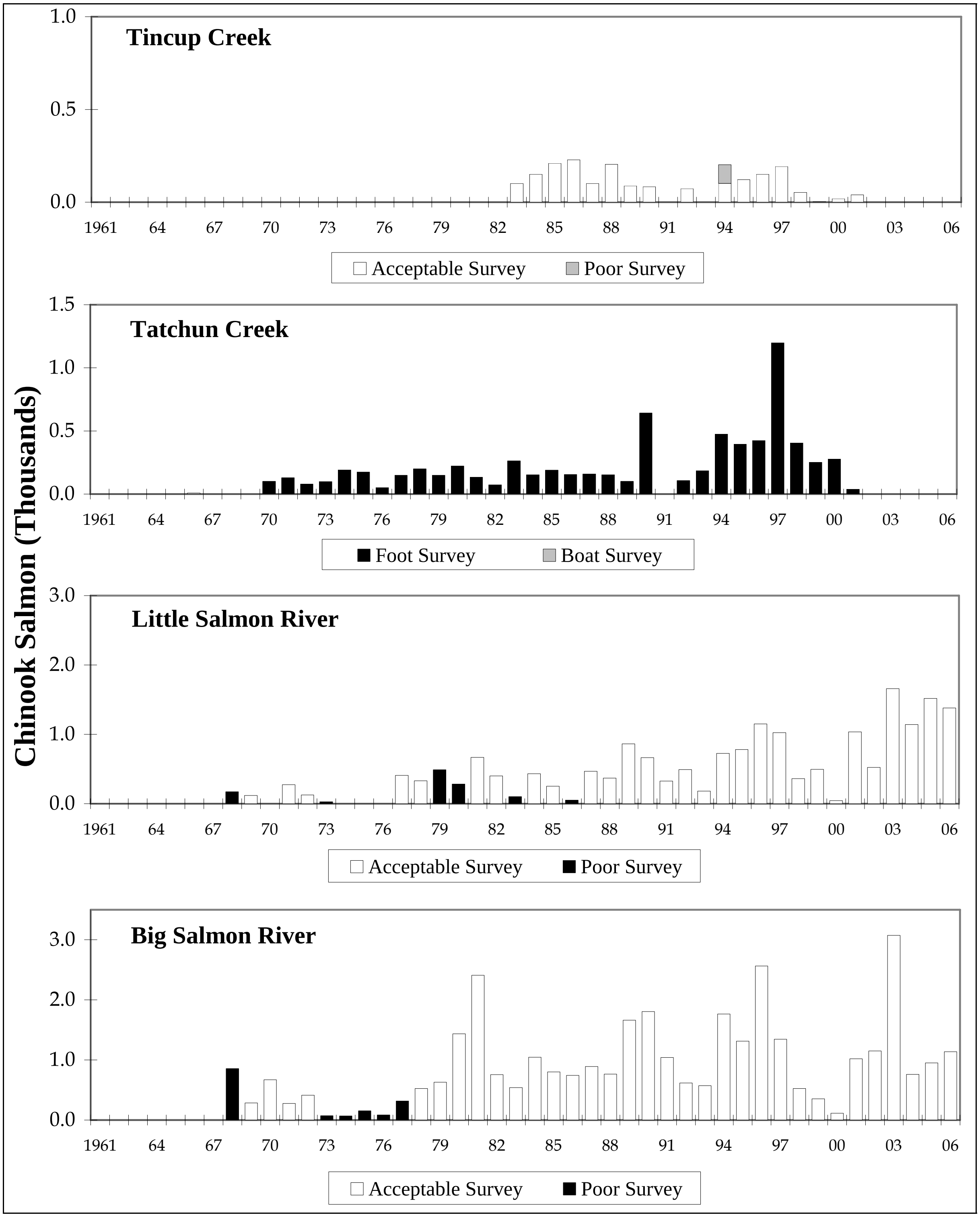
Appendix Figure B9.–Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2006.

-continued-

Appendix Figure B9.–Page 2 of 2.







Note: Data are aerial survey observations unless noted otherwise. The vertical scale is variable.

Appendix Figure B10.–Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2006.

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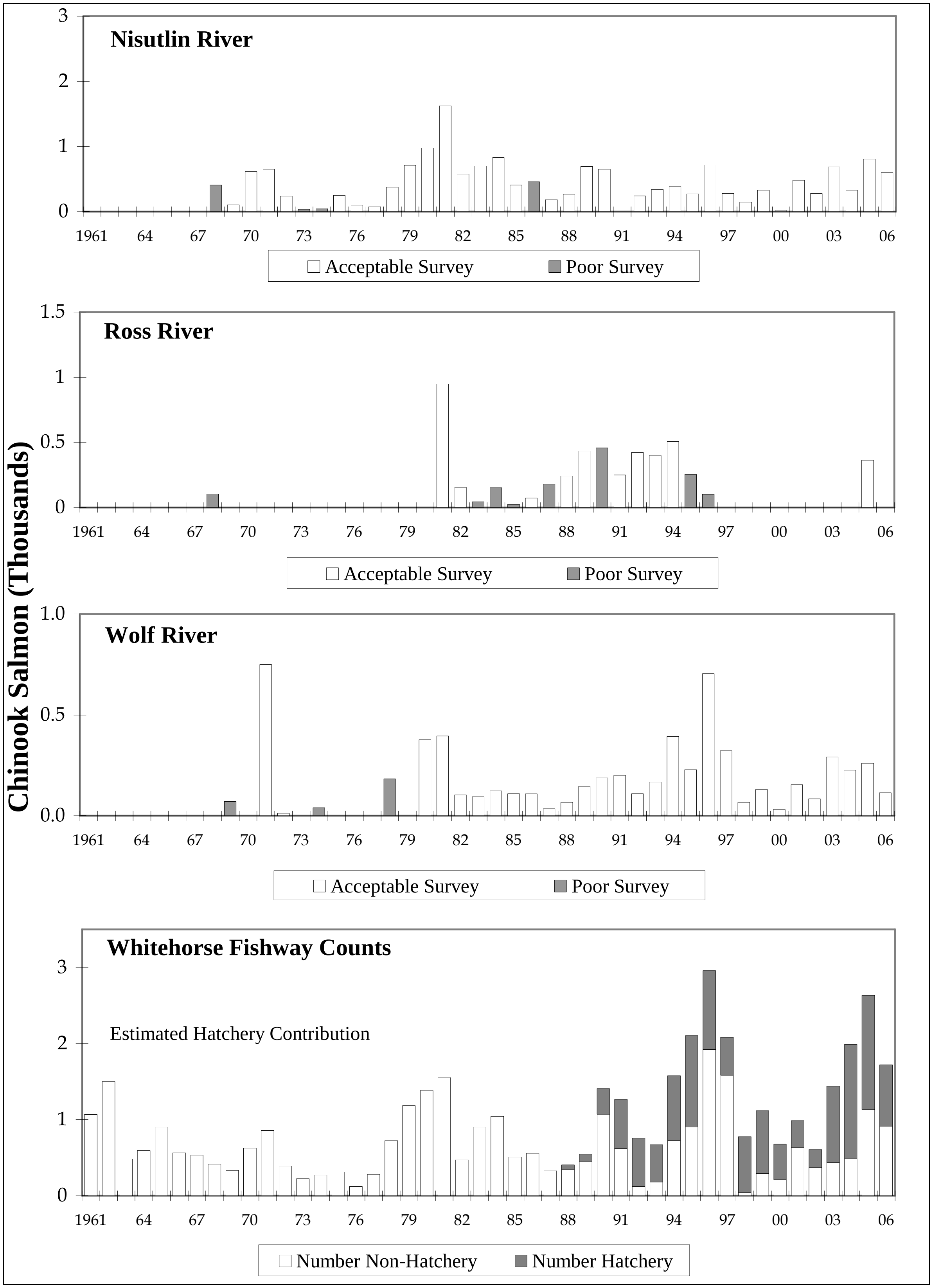
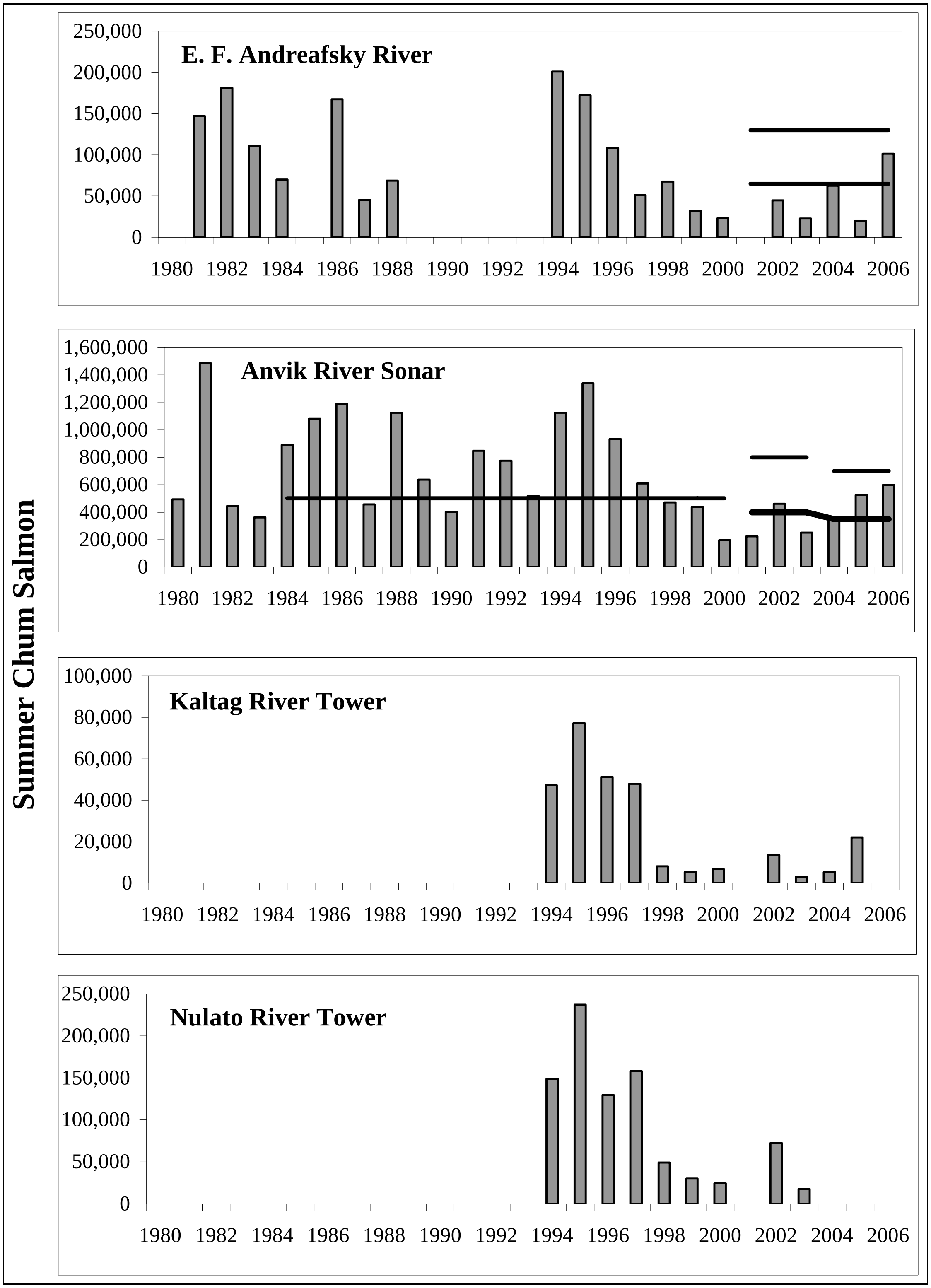
Appendix Figure B10.–Page 2 of 2.



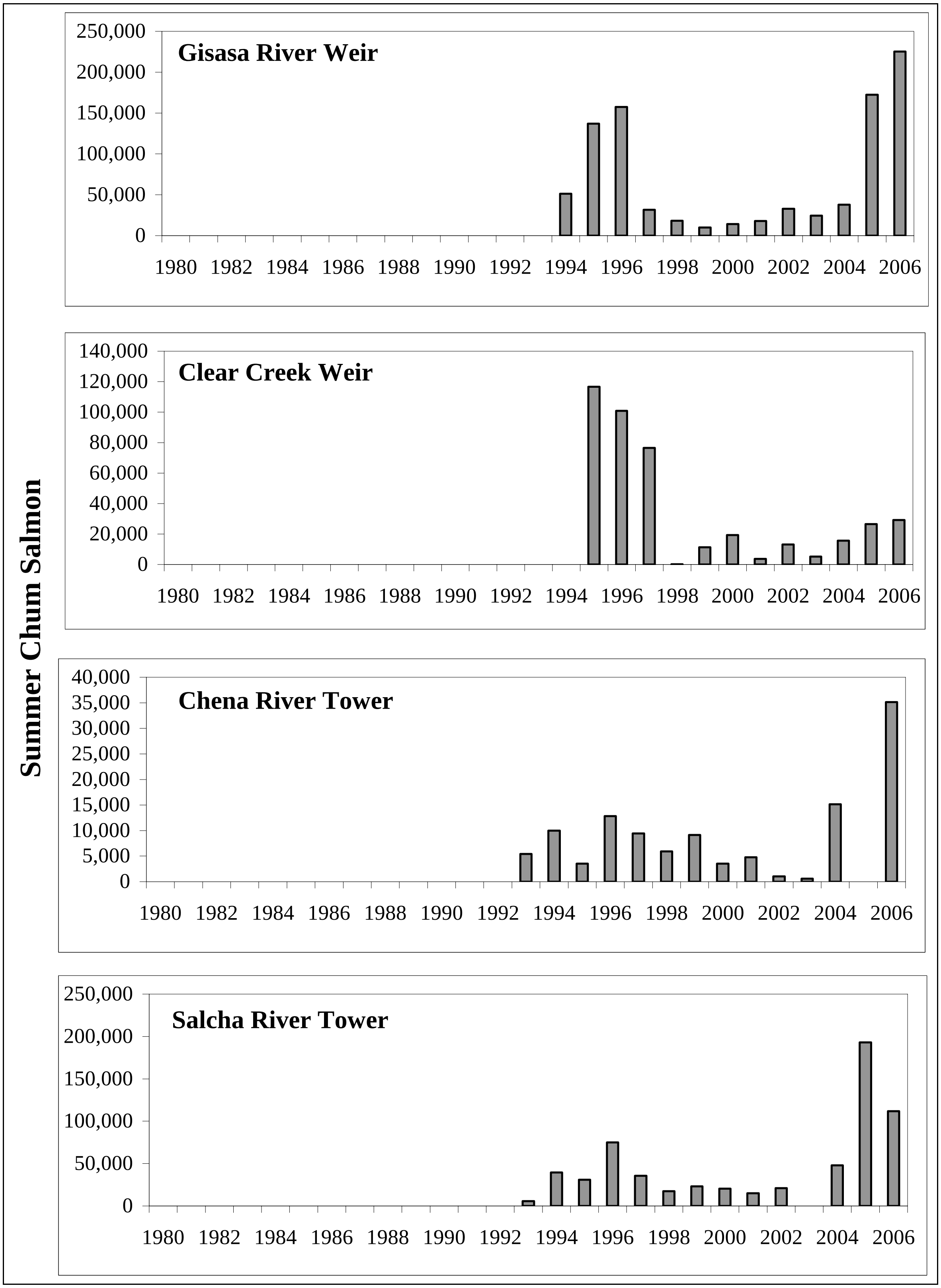


Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

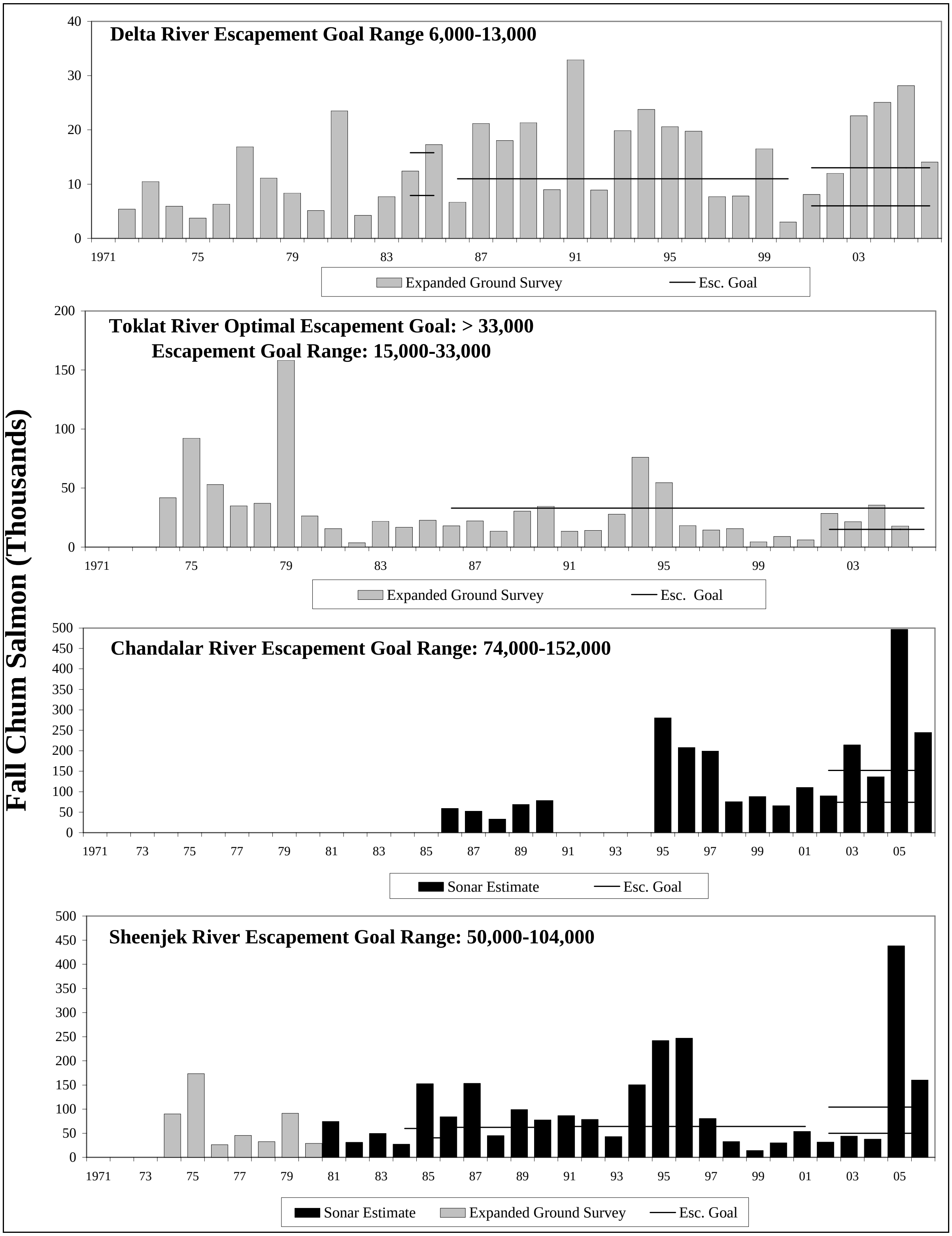
Appendix Figure B11.–Summer chum salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1980–2006.

-continued-

Appendix Figure B11.–Page 2 of 2.

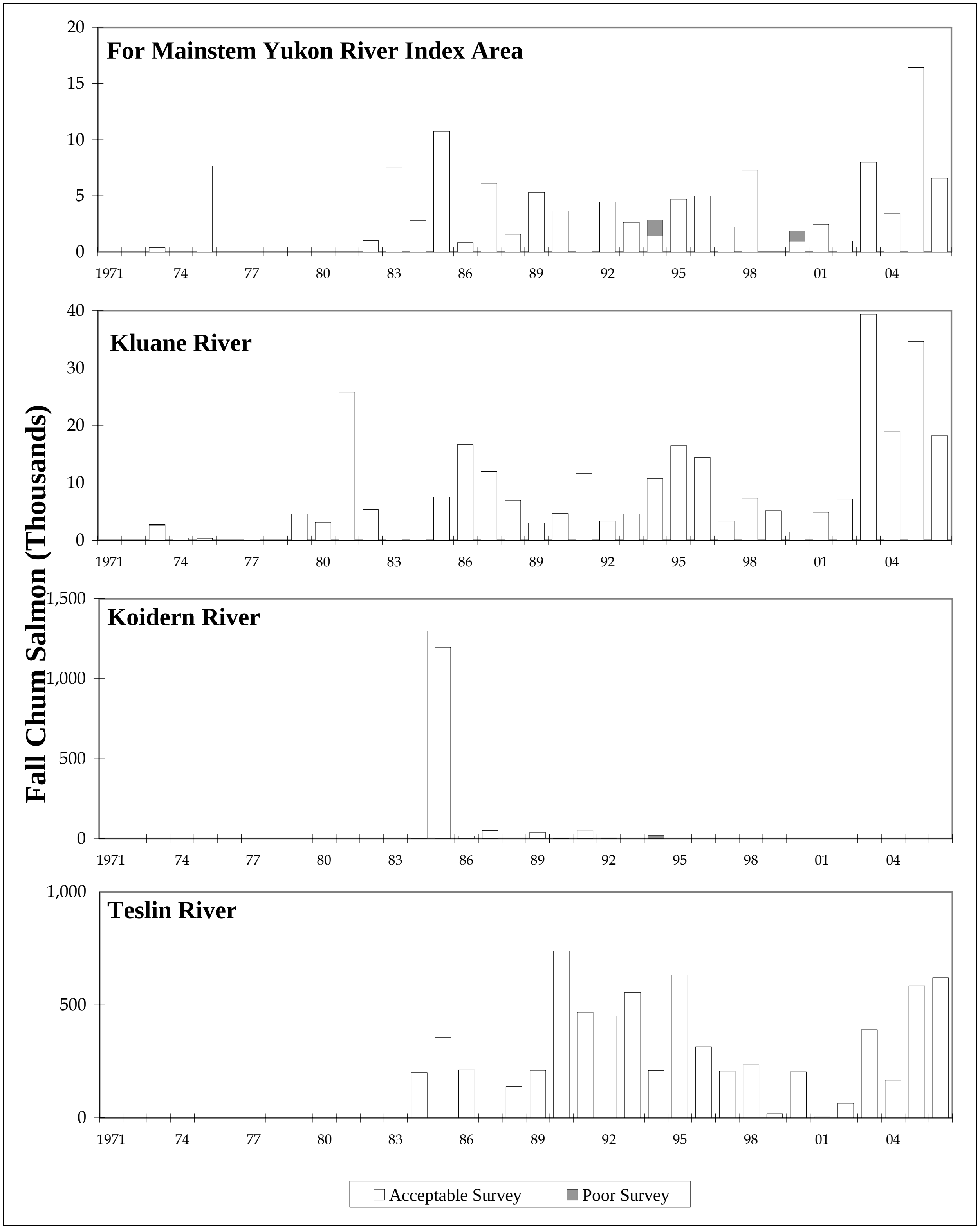


Note: Clear Creek estimates in 2006 by Videography.



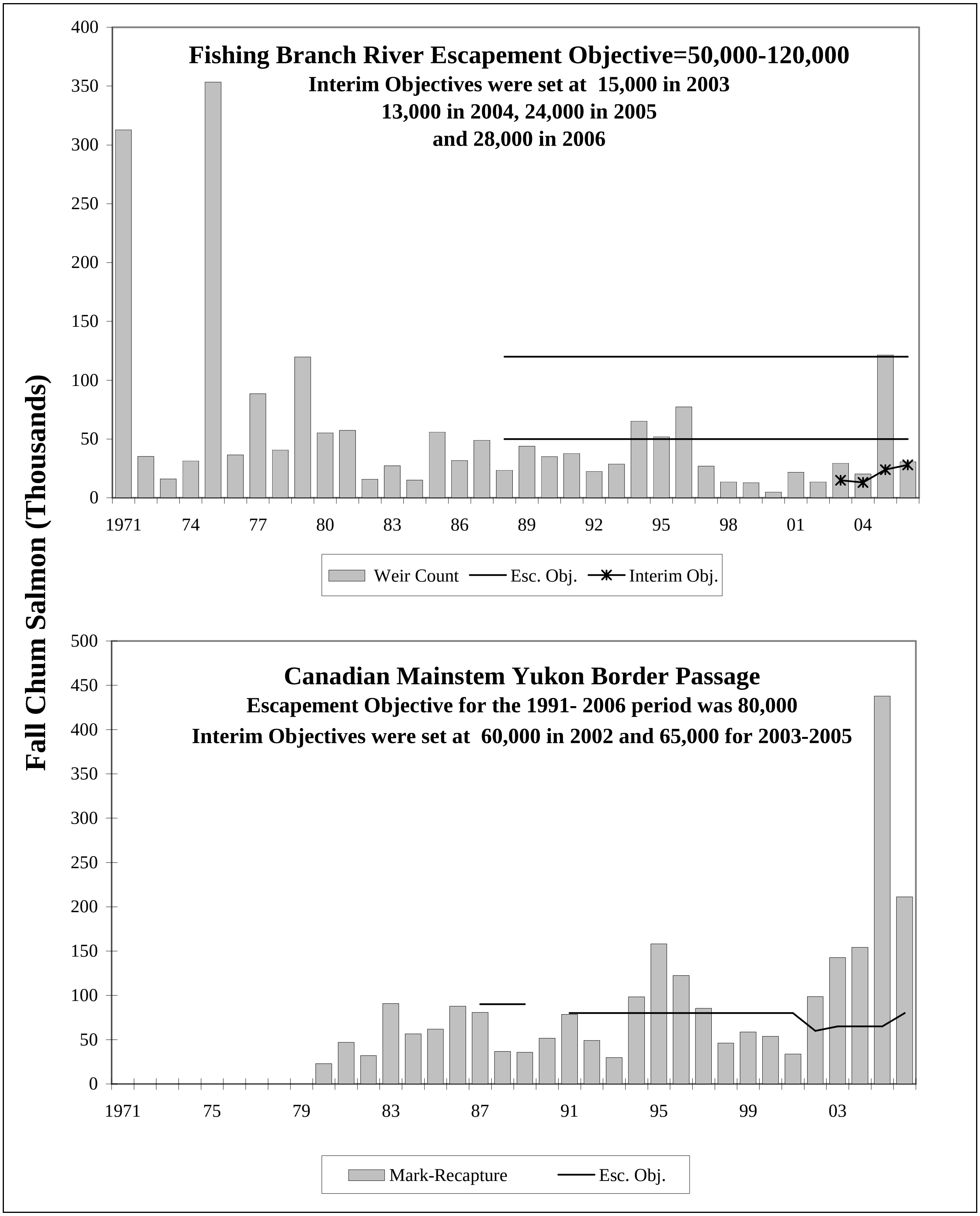
Note: Horizontal lines represent biological escapement goals or ranges. The vertical scale is variable.

Appendix Figure B12.–Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971–2006.



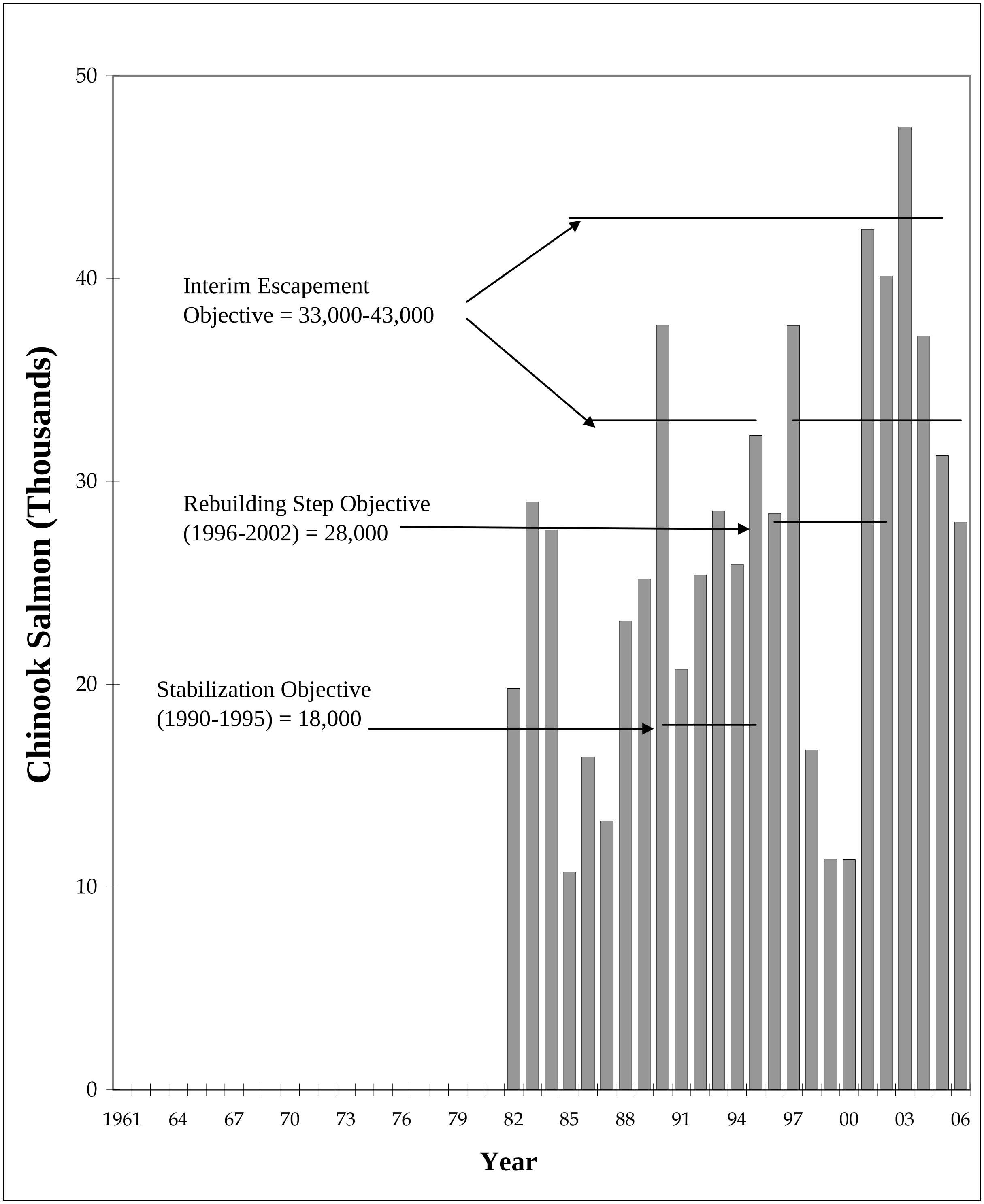
Note: vertical scale mainstem and Kluane in thousands, while the Koidern and Teslin are in hundreds.

Appendix Figure B13.–Fall chum aerial survey data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971–2006.



Note: Horizontal lines represent interim escapement goal objectives or ranges.

Appendix Figure B14.–Fall chum salmon escapement estimates for spawning areas in the Canadian portion of the Yukon River drainage, 1971–2006.



Note: Horizontal lines represent the interim escapement objective range of 33,000–43,000 salmon, the rebuilding step objective of 28,000 salmon and the stabilization objective of 18,000 salmon.

Appendix Figure B15.–Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982–2006.